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Aircraft Structural Repair Technician

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Aircraft Structural Repair Technician

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LIST OF OCCUPATIONAL ANALYSES

* Aircraft Gas Turbine Engine Repair and Overhaul Technician

Aircraft Structural Repair Technician (1992)

Aquaculture Technician (1977)

Arts Administrator (1989)

♦ Automotive Partsperson

♦ Automotive Service Manager

AUTOMOTIVE SERVICE TECHNICIAN (1990)

* Automotive Technician - Air-Conditioning, Engine Cooling and Heating

Automotive Technician - Automatic Transmission (1990)

* Automotive Technician - Diagnostic

Automotive Technician - Electrical/Electronics (1992)

Automotive Technician - Engine Repair and Fuel Systems (1989)

Automotive Technician - Front-End (1989)

Automotive Technician - Manual Transmission, Driveline and Brakes (1990)

BAKER (1991)

Blaster (Surface) (1987)

\+ **BOILERMAKER (1978)**

♦ **BRICKLAYER AND STONEMASON (1982)**

* **CABINETMAKER**

* **CARPENTER (1982)**

Cement Finisher (1983)

CONSTRUCTION ELECTRICIAN (1990)

COOK (1991)

* Crane Operator (1984) - Next edition will be Red Seal

Electrical Mechanic (1981)

♦ **ELECTRONICS TECHNICIAN - CONSUMER PRODUCTS**

Electronics Technician Vol. I (1986)
(Video Equipment)

Electronics Technician Vol. II (1986)
(Audio Equipment)

Electronics Technician Vol. III (1986)
(Computer Equipment)

Electronics Technician Vol. IV (1986)
(Office Equipment)

Electronics Technician Vol. VI (1986)
(Communication Equipment)

Electronics Technician Vol. VII (1986)
(Signaling Equipment)

Electronics Technician Vol. VIII (1986)
(Navigation Equipment)

Electronics Technician Vol. IX (1986)
(Video Game Equipment)

Electronics Technician Vol. X (1987)
(CADD Equipment)

Electronics Technician Vol. XI (1987)
(CAM Equipment)

Electronics Technician Vol. XII (1987)
(Robotics Equipment)

Electronics Technician Vol. XIII (1987)
(Biomedical and Laboratory Equipment)

Electronics Technician Vol. XIV (1987)
(Industrial Process-Control Equipment)

\+ Farm Equipment Mechanic (1981)

FLOORCOVERING INSTALLER (1991)

\+ Glazier (1986) - Next edition will be Red Seal

* Hairstyling and Barbering (1980) - Next edition will be Red Seal

Heating (Gas and Oil) Servicer - Commercial and Industrial (1978)

\+ **HEAVY EQUIPMENT MECHANIC (1987)**

Heavy Equipment Operator (1983)

* Home Builder - Low Rise

INDUSTRIAL ELECTRICIAN (1987)

INDUSTRIAL INSTRUMENT MECHANIC (1988)

INDUSTRIAL MECHANIC (MILLWRIGHT) (1988)

Informatics (1980)

♦ **INSULATOR (HEAT AND FROST)**

Interior Wall and Ceiling Finisher (1978)

♦ Ironworker (1977) - Next edition will be Red Seal

LINEMAN (1988)

* **MACHINIST (1984)**

Major Electrical Appliance Repairer (1984)

MOTOR VEHICLE BODY REPAIRER (1989)

♦ **MOTOR VEHICLE REPAIRER (TRUCK AND TRANSPORT) (1983)**

\+ **OIL AND SOLID FUEL HEATING MECHANIC (1986)**

♦ **PAINTER AND DECORATOR (1983)**

PLUMBER (1989)

Power Engineer (1986)

REFRIGERATION AND AIR-CONDITIONING MECHANIC (1989)

* Renovation Contractor - Residential

ROOFER (1991)

SHEET METAL WORKER (1990)

SPRINKLER SYSTEM INSTALLER (1986)

STEAMFITTER-PIPEFITTER (1989)

* Tool and Die Maker (1984) - Next edition will be Red Seal

WELDER (1989)

* new edition available - 1992-1993
♦ being processed
\+ scheduled for development or revision - 1992
RED SEAL ANALYSES ARE INDICATED IN CAPITAL BOLD LETTERS

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FOREWORD

The report of the study of human resources in the Canadian aircraft maintenance industry[1] forecasts a pending shortage of workers in several skilled occupations in the industry. Furthermore, the traditional means of filling these positions with skilled immigrants and Canadian Armed Forces personnel has to a large extent dried up. The aviation industry, as a whole, must now recruit and train its future skilled workers from the youth or unskilled people in Canada.

While there are national standards for some aviation positions, resulting from the federal government requirement for a Department of Transport aircraft maintenance engineer licence, many of the skilled support occupations do not require a licence and have therefore suffered from the absence of national occupational standards.

With the support of an Employment and Immigration Canada (EIC) Industrial Adjustment Service agreement, the aviation industry has been able to develop this first aircraft maintenance occupational standard for the Aircraft Structural Repair Technician. Other standards will follow; the second is under development for the Aircraft Gas Turbine Engine Repair and Overhaul Technician.

As a result of the human resource study and a subsequent Aviation Maintenance Human Resource Conference, the Canadian Aviation Maintenance Council was formed in October 1991. The Council, which is the executive body, and a wider-based Forum, to be formed in June 1992, will support industry in recruiting and training workers for the skilled occupations in aviation maintenance.

The Council will work with the federal, provincial and territorial governments, as well as post-secondary training colleges to develop the training programs and curricula that will provide the required academic and practical training to meet these occupational standards.

The objectives of the standards will be two-fold:

1. To facilitate the mobility in Canada of trainees and skilled workers in the aviation maintenance industry.

2. To supply employers and employees, their associations, training institutions and governments with the analyses of the tasks performed in the skilled occupations within the aviation maintenance industry.

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[1]Employment and Immigration Canada, Human Resources in the Canadian Aircraft Maintenance Industry, March, 1991, Catalogue No. LM 132 E/2/91

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GUIDE TO ANALYSIS

SCOPE OF ANALYSIS

This occupational analysis is directed at the aircraft structural repair technician whose primary responsibilities include: assessing damage and corrosion of aircraft structures; repairing, replacing and modifying sheet metal and/or composite structures; and, depending upon the nature of the shop, repairing fabric surfaces and wood structures. These duties are completed with the use of sophisticated and specialized tools and equipment. The technician brings to all tasks basic knowledge and experience in a variety of areas including: hand tool operation and maintenance, jig and fixtures construction, and the ability to install fasteners, seal structures and assemble parts.

In addition, the structural repair technician in some shops may be asked to perform specialized work practices and processes such as the fabrication/repair and modification of fluid lines and fittings as well as the repair and replacement of windows and lenses.

This occupation is predominantly found in national and regional carriers and speciality repair shops. For some companies, the duties of the aircraft structural repair technician overlap with the services performed by other speciality mechanics and technicians. This is particularly true of the tasks which relate to the specialized work practices.

DEVELOPMENT OF ANALYSIS

A draft of this analysis was prepared and edited by persons having extensive knowledge and experience in the aircraft structural repair field.

The draft was then sent to 95 aircraft structural repair technicians, the majority of whom had more than 10 years experience. This group was asked to review the tasks and sub-tasks and rate these in terms of importance, frequency and difficulty of performance. The validators were also asked to submit editorial comments. The results from this initial survey were reviewed by the project steering committee who identified specific task areas for further validation and investigation.

An updated draft of the analysis and a second survey instrument were sent to a second validation group of aircraft structural repair technicians as well as other interested parties from provincial/territorial Apprenticeship Branches and educational facilities. There were 150 packages sent out during this phase. The results from this second survey were reviewed by the project steering committee and the final draft was prepared.

The final draft has been translated and printed in both official languages.

STRUCTURE OF ANALYSIS

To facilitate the understanding of the nature of the occupation, the work performed is divided into the following divisions.

A. **BLOCK** - is the largest division within the analysis and reflects a distinct operation relevant to the occupation.

B. **TASK** - is the distinct activity, that combined with others, makes up the logical and necessary steps the worker is required to perform to complete a specific assignment within a "BLOCK".

C. **SUB-TASK** - is the smallest division into which it is practical to sub-divide any work activity and, combined with others, fully describes all duties constituting a "TASK".

Enabling Objectives

That element of skill and knowledge that an individual must acquire to perform the task adequately.

Trend

Any shifts or changes in technology that affect the sub-tasks are identified under this heading.

OBSERVATIONS AND TRENDS ARISING FROM ANALYSIS

The aviation maintenance industry in Canada continues to have a diversified fleet of aircraft which requires the care and attention of its skilled workers.

At one end of the spectrum are the commercial jets aircraft which are in common use with the national and regional air carriers. The newer aircraft in this group are incorporating more and more light weight composite structures. The older aircraft are being operated beyond their originally planned economic and structural lives, requiring additional meticulous structural inspections and careful structural repair.

Both the aircraft manufacturers and the aviation authorities are insisting on the extreme attention to detail with repairs, both from a structural point of view (such as edge distances, hole and countersink sizes, rivet and bolt fits, etc.), as well as corrosion prevention. The technical instructions in manufacturers' repair manuals and service bulletins are becoming more complex, requiring a higher level of written comprehension from workers.

Although the Aloha Airlines Boeing 737 'convertible' aircraft accident resulted in a miraculously small loss of life, the political, regulatory and technical repercussions in the industry have been immense. There is now a greater concentration on non-destructive inspection techniques, coupled with a continuing regulatory oversight of maintenance activities, with particular emphasis on the structural repair sector.

At the other end of the Canadian aviation spectrum, very old designs of aircraft continue to operate, including a number of commercial aircraft. (Most McDonnell-Douglas DC-3 aircraft are now well over 50 years of age - considerably older than the pilots who fly these aircraft.) Thus, there is the need to retain the skills required to repair aircraft having part or completely wooden structures, as well as wing and empennage surfaces that are fabric covered. The trend here is towards the use of synthetic rather than natural fibre covering materials.

In time, most aircraft will have a combination of composite material and high strength aluminum alloy structures. Since weight saving is always critical, the aluminum alloy surfaces will continue to be machined or chem-milled to produce optimum thickness of skin. Close tolerance rivets and bolts will require special interference fits to reduce local tensile stresses and improve fatigue properties. Lives of damage-tolerant structures will typically be 60,000 to 90,000 hours, compared to 30,000 hours for the early generation of commercial jet aircraft.

Composite structures will demand more complex means of structural inspection and the repairs will become more sophisticated, requiring special equipment, as well as enhanced worker skills.

The changing technology and continued use of older aircraft are rapidly broadening the scope of knowledge and skills required by members of this trade. The standards applied to older aircraft are not always valid on some of the newer aircraft and in some case repair techniques are proprietorial. These factors often leave the structural repair technician in the position of having to ascertain the standard to be applied, rather than merely applying previously learned standards.

The trend will be towards structural repair technicians who have an ability to absorb complex information from manufacturers' manuals and other instructions. There will be a need to work closely with specialists in non-destructive inspection. In addition, the repair requirements for rivetting, bolting, surface treatments and corrosion prevention will become more complicated.

Although the fundamental processes will not change, we will however see a higher demand for closer tolerances and levels of inspection. The structural repair occupation will continue to grow both in size and scope, requiring individuals with a broad basic knowledge and the ability to make complicated decisions, while continuing to learn new skills and knowledge throughout their careers.

ANALYSIS

BLOCK A BASIC KNOWLEDGE AND EXPERIENCE

Task 1 **Demonstrates safe working practices and techniques.**

Trend: Increased numbers of workers are taking first aid and Workplace Hazardous Materials Information System (WHMIS) training. New materials used in aircraft construction require an increased use of personal safety equipment and clothing.

Sub-tasks	Enabling Objectives	Tools & Equipment
1.01 Recognizes potential health and safety hazards.	knowledge of potential hazards including paint, resin and sealant fumes, explosive fumes, dust, friction materials, sound levels, electrical and mechanical hazards, acid vats, pressurized lines and lines containing corrosive and/or explosive fluids and gases knowledge of work hazards such as operation of power tools, cutting and grinding tools, torches, wrenches and hydraulic presses knowledge of WHMIS legislation	
1.02 Recognizes and handles hazardous materials.	knowledge of types of hazardous materials and their composition knowledge of Workplace Hazardous Materials Information System knowledge of recommended procedures for storage and disposal of hazardous materials such as resins, fuel and oil	

Sub-tasks		Enabling Objectives	Tools & Equipment
		ability to interpret material safety data sheets for instructions on the labelling, storage and disposing of chemicals and hazardous materials such as chromic acid, alodine, aircraft paint, resins and sealants	
1.03	Complies with government safety standards and regulations.	knowledge of WHMIS and applicable safety acts, Workers' Compensation Board regulations and provisions for reporting accidents and fires	
1.04	Uses personal protective equipment and clothing.	knowledge of types and uses of personal protection equipment knowledge of operating procedures of safety equipment ability to assess work site and select required safety equipment	goggles, safety glasses, face shields, gas masks, ear muffs, gloves, safety aprons, safety boots, respirator
1.05	Operates emergency safety equipment.	knowledge of operating procedures for emergency safety equipment knowledge of emergency phone numbers and area evacuation procedures ability to locate and operate emergency safety equipment	fire extinguishers, fire blankets, stretchers, respirator, first aid station, emergency showers, eye wash stations, fire hoses
1.06	Maintains good housekeeping.	ability to maintain cleanliness and order in work area ability to correctly store tools, shop equipment and loose objects ability to recognize and remove hazards ability to keep aisles clear	

	Sub-tasks	Enabling Objectives	Tools & Equipment
		ability to clean up spills and to dispose of waste material in accordance with government and company standards	
1.07	Uses and maintains tools and equipment in safe manner.	knowledge of unsafe tools such as mushroomed hammer heads, split handles, frayed cables, bulged hoses, poor electrical connectors and grounding requirements knowledge of power tool hazards knowledge of spark proof tools knowledge of hand tools and their safe use	hand tools, power tools, shop equipment
1.08	Assures protection from fire hazards.	knowledge of correct methods for extinguishing different types of fires knowledge of explosion and implosion hazards ability to identify aircraft fluid, gas and electrical lines ability to promote proper storage and handling of flammable materials, liquids and gases ability to maintain clear safety exits at all times	fire extinguisher
1.09	Reports injuries to supervisor.	knowledge of applicable safety acts knowledge of regulations and provisions for reporting accidents and safety violations knowledge of forms to be completed and information required for reports	

Task 2 **Accesses reference material and documents work completed.**

Trend: To a greater use of product-specific written materials and directions provided by manufacturers.

	Sub-tasks	Enabling Objectives	Tools & Equipment
2.01	Locates required information.	knowledge of available technical information in manufacturers, company and government publications and reference materials knowledge of aircraft structures components knowledge of major aircraft systems and their components ability to identify type, model and year of aircraft manufacture, parts and assemblies	aircraft blueprints, FAA-AC 43.13 manual, work orders & snag sheets, aircraft manufacturers' manuals: maintenance, illustrated parts catalogue, repair & overhaul, standard practices, technical service & modifications bulletins
2.02	Refers to service manuals and other related documents to identify repair procedures.	knowledge of written and diagrammatic repair sequences and ability to follow and apply them knowledge of sequential operations of repair and the ability to implement them ability to read blueprints and technical drawings ability to identify procedures, processes, tolerances and standards ability to identify job specific materials, fasteners, equipment, sealants and tools	
2.03	Complies with Aviation Regulations.	knowledge of applicable Transport Canada air regulations and airworthiness requirements for inspection and repair	

Sub-tasks		Enabling Objectives	Tools & Equipment
		knowledge of airworthiness engineering approvals of repair data by manufacturers and authorized designers such as Design Approval Representatives knowledge of Transport Canada procedures for airworthiness certification and release of aeronautical products after repair	
2.04	Completes documents after treatment or repairs.	knowledge of legal liability and ethical implications of completed work knowledge of required information including work performed, time required, parts replaced or external services used ability to complete work orders, log book entries and material lists and forward document for appropriate certification	

Task 3 **Selects, operates and maintains hand, power and measuring tools.**

Trend: To a greater use of product-specific tools.

Sub-tasks		Enabling Objectives	Tools & Equipment
3.01	Selects and operates hand tools for service and repair of aircraft structures.	knowledge of standard American and metric tool sizes knowledge of purposes, types, styles and operation of hand tools ability to use hand tools	wrenches, socket drive sets, hammers, punches, chisels, pliers, screwdrivers, torque wrenches, files, bucking bars, clamps, vices, rivet gun, aviation snips

	Sub-tasks	Enabling Objectives	Tools & Equipment
3.02	Selects and operates pneumatic and electric power tools for service and repair of aircraft structures.	knowledge of purposes, types and operation of power tools ability to use power tools including protective equipment, shields and guards ability to electrically ground, secure and prepare work pieces	hand and bench drills, hand and bench grinders & sanders, air ratchets, air drills
3.03	Selects and operates cutting tools for service and repair of aircraft structures.	knowledge of purposes, types and operation of cutting tools ability to use cutting tools including protective clothing, eye and face protection, hand and foot protection	hacksaws, files, routers, chisels, drills, cutting shears, pliers, saws
3.04	Maintains basic hand, cutting and air tools.	knowledge of cutting tools and their uses ability to lubricate, store and adjust hand and power tools ability to sharpen and reshape hand tools ability to clean files and reamers	
3.05	Selects and operates measuring tools.	knowledge of purposes, types and operation of measuring tools ability to use measuring tools including weigh scales, squares, straight edges and measuring cups to measure dimensions, volume, weight and pressure	combination sets, weigh scales, squares, straight edges, tape measure, plumb bob, pressure gauges, vernier, callipers, compass, levels, protractors, micrometers

Task 4 **Treats metals and corrosion.**

Trend: Towards the introduction of surface treatments for aircraft materials and a greater variety of chemical treatments for removing corrosion and protecting metal surfaces.

	Sub-tasks	Enabling Objectives	Tools & Equipment
4.01	Refers to technical information.	knowledge of technical information contained in manufacturers' reference material, SRM, work/snag sheets, production permits, process standards, engineering bulletins and overhaul, maintenance, vendor and parts manuals ability to identify and locate information ability to identify procedures, materials, processes, equipment and standards ability to interpret information in order to sequence procedures	
4.02	Sand/bead blasts metal surfaces.	knowledge of ferrous and non-ferrous metal alloys knowledge of blasting media and abrasive knowledge of blasting equipment operation knowledge of types of corrosion and corrosion removal techniques knowledge of safety protection clothing and equipment required for blasting metal surfaces	grit blasting equipment, hand/machine sanding equipment, wire brushes, scrapers, high speed drill, extractor fan, plastic cap/plugs, aluminum tape, lighting, clothing, ear muffs, respirator, safety glasses

	Sub-tasks	Enabling Objectives	Tools & Equipment
		ability to operate blasting equipment	
		ability to recognize when corrosion has been removed	
		ability to recognize different types of corrosion	
		ability to select corrosion removal techniques	
		ability to identify and cap areas/ducts/holes that need protection	
4.03	Cleans/etches aluminum alloy surfaces mechanically and chemically.	knowledge of types of alloys	chemical vats/baths, weighing scales, spray guns, brushes, abrasive pads, mixing tools, plastic cap/plugs, aluminum tape, safety apron, safety glasses, respirator
		knowledge of cleaning/ etching chemicals and their reaction to aluminum	
		knowledge of safety procedures, equipment and protective clothing	
		knowledge of chemical cleaning and etching procedures	
		knowledge of storage of chemicals	
		ability to prepare/mix chemical solutions	
		ability to treat surface abrasions and scratches	
		ability to polish and sand surfaces	
		ability to clean/etch aluminum alloy surfaces	

Sub-tasks	Enabling Objectives	Tools & Equipment
4.04 Applies chemical coatings to aluminum alloy surfaces.	knowledge of corrosion protection techniques for aluminum alloys knowledge of surface preparation knowledge of agents which can be used to chemically protect aluminum alloy surfaces, such as alodine and iridite knowledge of storage techniques for chemical coatings and chromic acid knowledge of safety procedures, equipment and protective clothing knowledge of disposal of hazardous waste ability to select protection agent ability to prepare mixture ability to perform and assess water surface tension test ability to select method of application, such as brushing, spraying and dipping ability to apply the solution and time application ability to check for colour change of material ability to flush excess solution from aluminum surface ability to dispose of hazardous waste	brushes, spray guns, wipers, chemical vats/baths, abrasive pads, mixing tools, weighing scales, respirator, safety glasses, fireproof apron, gloves, hazardous waste container

	Sub-tasks	Enabling Objectives	Tools & Equipment
4.05	Applies chromate primers.	knowledge of surface preparation and condition requirements knowledge of application techniques knowledge of primers and materials knowledge of shelf-life of primers knowledge of safety procedures, equipment and protective clothing ability to visually inspect and clean surface ability to set up spray booth ability to measure and mix primers ability to select technique, such as spraying, dipping and brushing ability to apply primer ability to time cure ability to test for dryness	wipers, ventilation fan, regulator, compressor, brushes, baths, explosion proof lighting, spray booth, paint pots, electrostatic spray guns, measuring tools, mixing tools, mixing containers, fireproof cabinets, safety apron, safety glasses, respirator
4.06	Heat-treats aluminum alloys.	knowledge of heat treatment processes, such as annealing, solution heat treatment and precipitation heat treatment methods knowledge of differences between sodium bath and air convection oven procedures knowledge of procedures for heat-treating different alloys knowledge of service techniques for sodium tanks	heat-treat ovens, air & salt baths, cooling bath/tanks, baskets, wire hooks, racks, pyrometer, recording equipment, goggles, fireproof aprons

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of safety procedures, equipment and protective clothing	
	ability to identify alloy group	
	ability to select heat-treat technique and procedure	
	ability to heat and soak part	
	ability to select and perform cooling technique	
	ability to time the cooling process	
	ability to select and perform aging technique	
	ability to rinse parts thoroughly that have been removed from sodium bath	
	ability to conduct hardness test	
	ability to service sodium tank	
	ability to complete documentation	
4.07 Shot/flap-peens metal surfaces.	knowledge, purpose and techniques of shot-peening	shot-peening equipment, flap-peening equipment, safety goggles, gloves, ear muffs, timer
	knowledge, purpose and techniques of flap-peening	
	knowledge of shot/flap-peening test standards	
	ability to set up shot-peening equipment	
	ability to operate shot-peening equipment	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to compare shot-peening results to a standard (sample piece)	
	ability to set up flap-peening equipment	
	ability to operate flap-peening equipment	
	ability to compare flap-peening results with standard	
4.08 Primes/paints metal aircraft parts and assemblies.	knowledge of surface requirements for priming and painting metal surfaces	brushes, sprayers, dipping bath, air compressor, air regulator, measuring tools, mixing tools, curing equipment, grounding wire, electrostatic spray guns, paint pots, ventilation fan, respirator, safety glasses
	knowledge of types, characteristics and uses of primers/paints	
	knowledge of application techniques	
	knowledge of paint removal chemicals and techniques	
	knowledge of paint/primer storage and shelf-life	
	knowledge of curing times/conditions for paints	
	knowledge of safety procedures, equipment and protective clothing	
	ability to prepare surface for priming/painting	
	ability to measure and mix primers and paints	
	ability to apply paints and primers	
	ability to electrically ground an aircraft	
	ability to remove primer/paint	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to set up spray booth	
	ability to set up curing equipment	
4.09 Protects steel tubular structures internally.	knowledge of characteristics of applications of steel tubular structures	drill equipment, injection filling equipment, blind riveting equipment, regulator
	knowledge of internal protection techniques including oils and gases for tubular structures	
	ability to select location to be drilled	
	ability to drill entry and exit holes for liquid protection	
	ability to fill tubular structure with water displacing agents	
	ability to rotate structure and drain excess water displacing agents	
	ability to connect and fill structure with inert gas	
	ability to observe pressure indicator to check for leaks	
4.10 Applies water displacing compounds to metal alloys.	knowledge of surface requirements for water displacement	spray equipment, extractor fans
	knowledge of corrosion prevention techniques	
	knowledge of aircraft areas prone to corrosion	
	knowledge of water displacement agents	

	Sub-tasks	Enabling Objectives	Tools & Equipment
		ability to gain access and inspect areas prone to corrosion	
		ability to prepare/clean surface areas	
		ability to fill and operate spray equipment	
4.11	Replaces levelling compounds.	knowledge of requirements to replace levelling compounds	aircraft levelling equipment, measuring tools, mixing tools, extractor fan, weigh scale, safety goggles, gloves, respirator
		knowledge of removal process for compounds	
		knowledge of compound preparation, application and storage	
		knowledge of aircraft levelling procedures	
		knowledge of safety procedures, equipment and protective clothing	
		ability to inspect drainage areas for proper operation of drains	
		ability to measure and mix compounds	
		ability to install levelling compound	
4.12	Attaches sacrificial anodes to metal structures.	knowledge of procedures to minimize galvanic corrosion	screwdrivers, wrenches
		knowledge of anodic scales	
		ability to select, size and suitably position anode	

Sub-tasks		Enabling Objectives	Tools & Equipment
4.13	Inserts dielectric material between, or coats dissimilar metals.	knowledge of galvanic corrosion knowledge of insulating materials that are non-absorbent knowledge of coating insulators knowledge of methods of application and coatings, such as spraying, brushing and dipping ability to identify dissimilar metals ability to cut insertion materials to size ability to drill, bolt and electrically bond insertion materials ability to apply insulation coatings to dissimilar metals	spray equipment, brushes, dipping bath, ventilation fan, air supply, air regulator, hand shears, mechanical shears, drill, goggles, rubber gloves, respirator

Task 5 **Constructs/sets up jigs and fixtures.**

Trend: Towards the use of laser for measuring and locating fixed points on jigs.

Sub-tasks		Enabling Objectives	Tools & Equipment
5.01	Interprets blueprints and drawings for jigs and holding fixtures.	knowledge of types of blueprints and drawings, such as production, lofted, detailed, assembly, repair and sub-assembly knowledge of information contained on drawings, such as finishes, scales, fasteners, materials, dimensions, tolerances, parts lists and assembly procedures	vernier, scale, compass, trammel points, surveyor's transit

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of location of drawings or consultations that are required	
	knowledge of layout of drawings, such as views and orientation of components	
	ability to identify assembly components and assembly procedures, fasteners and tolerances	
	ability to visualize three dimensional components and their orientation	
	ability to determine sequence of assembly	
	ability to document construction with drawing number	
5.02 Refers to structural repair manual and technical information for required jigs and holding fixtures.	knowledge of technical information contained in manufacturers' reference material, SRM, engineering bulletins and overhaul, maintenance, vendor and parts manuals	
	ability to identify and locate information	
	ability to identify procedures, materials, fasteners, processes, tolerances and standards	
	ability to interpret information in order to sequence procedures	
	ability to comply with technical information	

Sub-tasks		Enabling Objectives	Tools & Equipment
5.03	Consults manufacturer and/or engineering department.	knowledge of requirement to seek approval for jigs and fixtures ability to develop contacts with manufacturer and/or engineering department ability to interpret information from manufacturer and/or engineering department	
5.04	Selects jig or fixture material.	knowledge of size and weight of aircraft component to be reworked knowledge of the specification for the part to be reworked knowledge of critical attachment points knowledge of the properties of materials to be used for jigs and fixtures ability to inspect jig or fixture materials for defects/damage	
5.05	Assembles jig or fixture.	knowledge of order/sequence of assembly knowledge of the materials, fasteners and tools required to assemble jigs and fixtures knowledge of dimensions and tolerances ability to layout jig/ fixture ability to weld, rivet, bend and cut material for jig or fixture ability to fit and fasten materials	welding equipment, brake press, shears, air drill, tube bender, square, straight edge, trammel points, plumb bob, screwdrivers

	Sub-tasks	Enabling Objectives	Tools & Equipment
5.06	Fits jig/fixture to sample component.	knowledge of reference/hard points on aircraft structure/assembly knowledge of attaching hardware knowledge of shimming and alignment procedures ability to sight-in jigs ability to trammel holding fixtures ability to adjust jigs and fixtures using shims and spacers	level, transit, trammel points, tape measure, plumb bob, ruler, air drill, wrenches, sockets, pry bar, hammer, line-up punches, drift punches
5.07	Seeks approval for jig or fixture.	knowledge of required documentation for approval such as drawings and measurements knowledge of department that provides approval, such as Department of Transport or manufacturer ability to prepare drawings of jigs and fixtures	

Task 6 **Seals structures.**

Trend: Towards the introduction of new sealant materials and the requirement for their use in the repair of greater numbers of aircraft structures and assemblies. Towards the greater use of sealants for corrosion control.

	Sub-tasks	Enabling Objectives	Tools & Equipment
6.01	Refers to structural repair manual and technical information.	knowledge of format, structure and location of information in SRM on sealing aircraft structures	

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of content of SRM, such as drawings, repair procedures, standards, tolerances, sealants and fasteners	
	knowledge of location of repair assembly	
	knowledge of aircraft components/assembly being sealed and their location	
	knowledge of types of technical manuals such as engineering orders, technical orders, service and engineering bulletins, manufacturer's manuals, sealants and fasteners manuals	
	ability to locate detailed components of aircraft structure in SRM	
	ability to determine sequence of assembly/repair	
	ability to document repair with SRM standard	
	ability to interpret technical information and identify required sealants	
	ability to interpret sealant manuals	
6.02 Prepares surfaces.	knowledge of preparation procedures and sequences, such as preliminary and final cleaning	scrapers, brushes, vacuum, air blowers, spray guns, cheesecloth, wipers, pipe cleaners, cotton swabs, solvents
	ability to clean surfaces	

Sub-tasks	Enabling Objectives	Tools & Equipment
6.03 Selects sealants.	knowledge of types, characteristics and uses of sealants knowledge of special precautions for silicones knowledge of application procedures for sealants ability to identify expiration date and assess shelf-life of sealants ability to store silicones separately from other sealants ability to identify equivalent substitute sealants	
6.04 Mixes sealants.	knowledge of proportions/ ratio of accelerator/ catalyst and base knowledge of set-up time and curing time of sealants knowledge of mixing times knowledge of texture and colour that indicate sealant is thoroughly mixed ability to weigh or measure components of two-part sealant ability to operate mixing equipment ability to quick freeze and maintain freezer storage of mixed sealing compounds ability to thaw frozen sealing compounds to room temperature	spatulas, machine mixer, weigh scale, measuring containers

Sub-tasks	Enabling Objectives	Tools & Equipment
6.05 Masks around area to be sealed.	knowledge of masking material	masking tape
	knowledge of required edge distances from repair area	
	ability to follow the contour of the repair	
	ability to maintain a constant edge distance	
	ability to remove masking tape without disturbing seal	
6.06 Applies sealant.	knowledge of proper application methods	spatula, brushes, gun applicator, masking tape, knife, shears
	knowledge of application equipment or tools	
	knowledge of amount of sealant to be applied	
	knowledge of curing temperatures and times	
	ability to apply sealant smoothly and to the correct thickness so that the sealant is neat, even and does not entrap air inclusions	
	ability to lay a bead and feather-edges	
	ability to inform maintenance personnel of curing requirements	
	ability to fillet seal	
	ability to seal faying surfaces	
	ability to apply sealant by brush coating	

Sub-tasks		Enabling Objectives	Tools & Equipment
		ability to seal fasteners during installation	
		ability to remove excess cured sealant	
		ability to use special precautions when applying silicone sealants	
6.07	Conducts positive and negative pressure test.	knowledge of leak testing procedures	soap
		knowledge of leak detecting liquids	
		knowledge to request pressurizing of aircraft	
		ability to pressurize fuel tanks	
		ability to apply vacuum pressure to detect internal leaks	
		ability to inspect structures for leaks	

Task 7 Installs fasteners.

Trend: Towards the development of more lightweight fasteners and fasteners with greater shear resistance. The introduction of new shapes for rivet heads and new material composition of rivets.

Sub-tasks		Enabling Objectives	Tools & Equipment
7.01	Reads blueprints and drawings.	knowledge of types of blueprints and drawings, such as production, lofted, detailed, assembly, repair and sub-assembly	vernier, scale, compass

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of information contained on drawings such as types and sizes of fasteners and fastener location, materials, dimensions, tolerances, location, processes and standards	
	knowledge of layout of drawings, such as views and orientation	
	ability to verify dimensions/information	
	ability to visualize three dimensional components in proper orientation	
	ability to visualize stages/order of assembly	
	ability to detect/recognize errors on drawings	
7.02 Refers to technical information.	knowledge of technical information contained in manufacturers' reference materials, SRM, work/snag sheets, production permits, process standards, engineering bulletins and overhaul, maintenance, vendor and parts manual	
	ability to identify and locate information	
	ability to identify fastener installation procedures, materials, tolerances and standards	
	ability to interpret information in order to sequence procedures	
	ability to comply with technical information	

	Sub-tasks	Enabling Objectives	Tools & Equipment
7.03	Selects fasteners.	knowledge of fastener standards ability to determine type, lengths and diameter of fasteners required	grip-length gauge, measuring tools, micrometer, vernier, calliper
7.04	Lays out fastener pattern.	knowledge of standards for rivet layout pattern knowledge of layout procedures ability to use measurement tools, such as straight edges, verniers, compasses, squares, centre punches and prick punches ability to layout fastener pattern	straight edges, verniers, squares, compass, punches, layout tools
7.05	Drills/reams and countersinks holes.	knowledge of drilling, reaming and countersink equipment and procedures knowledge of types and conditions of metals to be drilled/reamed/countersunk knowledge of various fits of fasteners such as Class 1,2,3, & 4 fits knowledge of suitable drilling lubricants knowledge of clearance drill sizes ability to select drill size ability to select drilling lubricants ability to deburr sharp edges	drills, reamers, countersink, deburring tools, air supply, regulator

	Sub-tasks	Enabling Objectives	Tools & Equipment
7.06	Cold works fastener holes.	knowledge of metal prestressing techniques for fastener holes ability to drill holes to specified size ability to ream hole to initial size ability to prestress holes with specialized tooling ability to ream hole to final size as per specifications and drawings	reamer, cold working tools, eye protection, air supply, regulator
7.07	Treats holes with alodine/paint.	knowledge of corrosion protection techniques knowledge of agents used to chemically protect metal surfaces ability to prepare mixture ability to chemically clean surface ability to brush solution ability to check and assess for colour change ability to wipe off excess	brushes, wipers, mixing tools, eye protection, gloves
7.08	Heat-treats rivets.	knowledge of heat treatment processes and rivet application techniques knowledge of method to reduce aging process of rivets ability to quench/soak rivets at required temperature	ice box, basket, salt bath, water vats, eye goggles, gloves, fireproof aprons

	Sub-tasks	Enabling Objectives	Tools & Equipment
7.09	Flap-peens bolt holes.	knowledge of methods to flap-peen various alloys ability to recognize holes requiring flap-peening ability to operate flap-peening equipment	flap-peening equipment, hand drills, eye goggles
7.10	Applies sealants to fasteners.	knowledge of sealants to be applied to different alloys knowledge of mixing and measuring and application procedures knowledge of curing process ability to measure and mix sealant ability to chemically clean fasteners ability to remove excess sealant with cleaning solution	brushes, dipping bath, gloves, eye goggles
7.11	Bucks rivets.	knowledge of setting rivets knowledge of communication signals or systems to be used during rivet installation ability to recognize acceptable rivets ability to recognize acceptable shop heads on rivets ability to select rivet gun and bucking bar ability to organize installation procedure and work in teams	squeeze riveter, bucking bars, rivet guns, air supply, regulator, ear muffs

	Sub-tasks	Enabling Objectives	Tools & Equipment
7.12	Applies/installs fasteners, washers, and collars.	knowledge of fasteners requiring special installation tools knowledge of fastener assemblies with collars knowledge of temporary fastener installation ability to recognize acceptable rivets/fasteners ability to remove unacceptable rivets ability to assemble fasteners with special tools ability to assemble fasteners with collars ability to assemble temporary fasteners such as Cleco or Avdel fasteners	Cleco pliers, specialized pliers
7.13	Tightens/torques threaded fasteners.	knowledge of fasteners requiring special installation tools knowledge of temporary fastener installation knowledge of the purpose of witness-wiring knowledge of torque procedures knowledge of fastener locking devices such as lockwires, tab washers and locking clips ability to recognize acceptable rivets/fasteners ability to identify and remove unacceptable rivets	torque wrench, Cleco pliers, wire twisters

	Sub-tasks	Enabling Objectives	Tools & Equipment
		ability to assemble fasteners with special tools	
		ability to assemble temporary fasteners such as Cleco or Avdel fasteners	
		ability to torque bolts as per specifications	
		ability to install fastener locking devices such as lockwires, locking clips and tab washers	
		ability to install witness-wire	
7.14	Swages ends on hi-shear and huck bolt fasteners.	knowledge of types of swaging methods	swaging tools, measuring tools, bucking bars, eye goggles
		knowledge of diameter and grip-length of fasteners	
		ability to select and use swaging tools	
		ability to measure for required grip-length	
		ability to use bucking bars (hi-shear only)	
7.15	Installs panel and cowling fasteners.	knowledge of structural and non-structural and structural panel/cowling fasteners	Cleco pliers, specialized pliers
		ability to differentiate between non-structural and structural fasteners	
		ability to remove unacceptable (damaged, cracked) panel or cowling fasteners	

Sub-tasks	Enabling Objectives	Tools & Equipment
7.16 Installs rivnuts and blind nuts.	knowledge of rivnut and blind nut installation techniques knowledge of rivnut and blind nut installation tools ability to select application tools ability to drill required clearance holes for rivnut and blind nut installation	drill, installation tools
7.17 Installs inserts.	knowledge of types of inserts knowledge of composite materials which require inserts knowledge of bonding compounds knowledge of techniques for bonding inserts to various composite materials knowledge of cleaning agents for preparing composite structure and inserts ability to measure and mix bonding compounds ability to locate insert position ability to prepare composite structure for insert installation ability to drill/rout ability to bond insert to composite structure	drills, routers, mixing tools, container, cleaning agent, tape, air supply, regulator, mask, respirator, heat lamp

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to identify and protect vulnerable surrounding surfaces	
	ability to wipe off excess bonding compound with cleaning agents	
7.18 Installs blind rivets and blind bolts.	knowledge of blind rivet/ bolt installation techniques and restrictions	drill, specialized installation tools such as pulling heads, mixing tools, mixing containers, weigh scales, grip gauge, air supply, regulator
	knowledge of diameter and grip-lengths for blind rivets/bolts	
	knowledge of sealing compounds to wet assemble blind rivets/bolts	
	ability to measure for grip length	
	ability to select required rivet type as per specifications	
	ability to select required pin/collar combination as per specifications	
	ability to drill/ream holes to correct tolerance	
	ability to use installation tools for blind rivets/ bolts	
	ability to wet assemble blind rivets/bolts	
	ability to measure, mix and apply sealants	

Task 8 **Assesses corrosion to aircraft structures.**

Trend: To a greater use of non-destructive testing services.

	Sub-tasks	Enabling Objectives	Tools & Equipment
8.01	Reviews log book/snag sheets.	knowledge of cabin and journey log books ability to access log book/snag sheets ability to interpret log entries or snag sheets ability to determine location of damage	
8.02	Gains access to corroded area.	knowledge of structure of corroded area knowledge of fasteners in corroded area knowledge of methods of removing corroded structure such as cutting, sawing, drilling and routing ability to remove fasteners such as rivets, bolts and screws ability to move obstructing electrical, hydraulic and fuel lines to provide working space ability to use cutting tools such as drawknife, cutting wheel and snips	drawknife, metal snips, cutting wheel, die grinder, air drill, drill bits, screwdrivers, wrenches, hammer, punches, router
8.03	Inspects aircraft structure visually.	knowledge of types of corrosion such as galvanic, intergranular, pitting, stress, surface, fretting and fatigue corrosion	magnifying glass, borescope, mirror, light

Sub-tasks		Enabling Objectives	Tools & Equipment
		ability to select appropriate visual aids such as mirrors, lights, magnifying glass and borescopes ability to identify types of corrosion	
8.04	Removes corrosion mechanically/ chemically.	knowledge of chemicals used to remove corrosion such as chromic acid, phosphoric acid and sulfuric acid (magnesium) knowledge of mechanical removal techniques such as sanding, grinding, glass-bead blasting, milling and machining ability to select chemical to remove corrosion ability to select method to remove corrosion such as sanding, grinding, bead blasting, sand blasting, milling and machining ability to buff and polish cleaned-out area	wire brushes, disc sander, sanding discs, die grinder, bead blaster, end mill, spot facer, buffing pads, abrasive papers, steel wool, aluminum wool, plastic scrubbing pads
8.05	Takes measurements and readings of corrosion depth/ thickness.	knowledge of manufacturers' accepted tolerance ability to use depth gauges ability to use micrometer and dial indicators ability to document measurements and readings	depth gauge, micrometer, dial indicator, ruler
8.06	Conducts metallic tap test of composites and bonded skins.	knowledge of defects associated with composites and bonded skins such as voids and laminations ability to interpret discrepancies in sound	coin, mini tap hammer

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to determine location of void or delamination	
8.07 Requests non-destructive testing.	knowledge of appropriate non-destructive tests such as magnetic particle inspection, x-ray or radiographic inspection, fluorescent penetrant, dye penetrant, ultrasound and eddy-current inspection	
	knowledge of non-destructive testing services	
	ability to interpret results of non-destructive test results	
8.08 Conducts dye penetrant test.	knowledge of dye and developer	
	knowledge of dye penetrant tests for surface cracks and defects and sub-surface flaws	
	ability to wash/clean-out area using vapour degreasing or volatile cleaners	
	ability to spray/brush or dip dye on cleaned-out area	
	ability to remove surplus dye penetrant	
	ability to apply developer to corroded area	
	ability to interpret test results	

Sub-tasks		Enabling Objectives	Tools & Equipment
8.09	Removes corroded parts.	knowledge of manufacturers' procedures to remove parts/ components knowledge of aircraft location identification codes knowledge of fasteners used in corroded area ability to remove fasteners	ratchet, sockets, wrenches, screwdrivers, cutters, air drill, drill bits, hammer, punches, scrapers, grinders
8.10	Determines if repair/replacement is required.	knowledge of damage limits as specified in technical manuals ability to consult engineering department or manufacturer for repair limitations ability to interpret manufacturer's damage limits	

Task 9 Assesses damage to aircraft structures.

Trend: To a greater use of non-destructive testing services and more specific instructions by manufacturers.

Sub-tasks		Enabling Objectives	Tools & Equipment
9.01	Reviews log book/snag sheets.	knowledge of cabin and journey log books ability to access log book/snag sheets ability to interpret log entries or snag sheets ability to determine location of damage	

	Sub-tasks	Enabling Objectives	Tools & Equipment
9.02	Gains access to damaged area.	knowledge of structure of damaged area knowledge of fasteners in damaged area knowledge of methods of removing damaged component such as cutting and drilling ability to remove fasteners such as rivets, bolts and screws ability to move obstructing electrical hydraulic and fuel lines to provide working space ability to use cutting tools such as drawknife, cutting wheel and snips	drawknife, metal snips, cutting wheel, die grinder, air drill, drill bits, screwdrivers, wrenches, hammer, punches
9.03	Inspects aircraft structures (primary/secondary) visually.	knowledge of types of damage such as dents, cracks, bends, holes and wear ability to identify types of damage ability to select appropriate visual aids such as mirrors, lights, magnifying glass and borescopes	magnifying glass, borescope
9.04	Requests non-destructive testing.	knowledge of appropriate non-destructive tests such as magnetic particle inspection, x-ray or radiographic inspection, fluorescent penetrant, dye penetrant, ultrasound and eddy-current inspection knowledge of non-destructive testing services ability to interpret results of non-destructive test results	

Sub-tasks	Enabling Objectives	Tools & Equipment
9.05 Makes sketch/trace of damaged area.	knowledge of aircraft location identification codes	
	knowledge of techniques used in drafting such as types of views, lines, symbols and standard dimensioning practices	
	ability to identify location identification code	
	ability to draw freehand sketch of damaged area	
	ability to convey to the sketch the dimensions of material removed from the part	
9.06 Obtains and interprets technical information.	knowledge of information contained in blueprints, sketches and drawings	
	knowledge of types, layouts and structure of manuals	
	knowledge of technical and aircraft terminologies	
	ability to consult with engineering/manufacturer concerning the extent of damage and inspection and repair procedure	
	ability to interpret manuals or instructions	
	ability to determine tolerances, sequence of repairs and materials	
9.07 Determines if repair/replacement is required.	knowledge of technical manuals where information on limits is found	
	ability to consult engineering/manufacturer for repair limitations	
	ability to interpret manufacturer's damage limits	

Task 10 **Assembles and fits parts.**

Trend: Towards more cold working of fastener holes and more wet rivet installations.

Sub-tasks	Enabling Objectives	Tools & Equipment
10.01 Arranges for assembly inspection.	knowledge of industry and Department of Transport inspection procedures	
	knowledge of industry/ manufacturer standards for aircraft assembly	
	ability to ensure component complies with company or Department of Transport certification (tags/labels)	
10.02 Reads blueprints and drawings.	knowledge of types of drawings and blueprints, such as production, lofted, detailed, assembly, repair and sub-assembly	
	knowledge of location of drawings or consultations that are required	
	knowledge of views and orientation of components	
	knowledge of information available on drawings such as tolerances, scales, dimensions, fasteners, materials, finishes, parts' lists and assembly procedures	
	ability to locate drawings	
	ability to visualize a three dimensional object/ component in proper orientation	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to interpret drawings for dimensions, component assembly, procedures, fasteners, sealants and tolerances	
	ability to determine sequence of assembly	
	ability to document repair with drawing number	
10.03 Refers to structural repair manual and technical information.	knowledge of format, structure and location of aircraft structures in Structural Repair Manual (SRM)	
	knowledge of content of SRM, such as drawings, repair procedures, standards, tolerances, sealants and fasteners	
	knowledge of location of repair assembly	
	knowledge of types of trade/technical materials, such as engineering orders, technical orders, service and engineering bulletins, manufacturers'reference material and overhaul, maintenance, vendor, parts manuals, sealants and fastener handbooks	
	ability to locate detailed drawings of components of aircraft structure in SRM	
	ability to determine sequence of assembly	
	ability to determine technical procedures and required fasteners for repair	
	ability to document repair with SRM standard	

Sub-tasks	Enabling Objectives	Tools & Equipment
10.04 Selects/constructs jigs or fixtures.	knowledge of requirement or function of jig or fixture in performing repair knowledge of requirement for certification of jig/fixture ability to determine from SRM, drawings, technical orders, service bulletins if jig or holding fixture is required ability to interpret jig/fixture drawings ability to select material for jigs and holding fixtures ability to fabricate jig or fixture by welding, riveting and fastening materials together	welding equipment, brake, shears, tube bender, air drill, square, straight edge, trammel, plumb bob, screwdrivers
10.05 Aligns parts.	knowledge of assembly procedures and standards/ tolerances knowledge of alignment tools knowledge of stress/strain limits of parts/components ability to determine manufacturers'/companies' procedures for aligning parts ability to sequence components for alignment ability to identify misaligned or out-of-tolerance fasteners, holes and components ability to maintain alignment of components during repair/assembly	clamps, vice straps, jigs, fixtures, temporary fasteners

Sub-tasks	Enabling Objectives	Tools & Equipment
10.06 Affixes parts with temporary fasteners.	knowledge of temporary fasteners knowledge of sequence of assembly ability to drill holes in specified location for alignment ability to use alternate/ secondary holding devices	temporary sheet fasteners, clamps, air drills, Cleco pliers
10.07 Takes measurements to maintain tolerances.	knowledge of types, operation and function of measuring devices ability to operate measuring devices in order to maintain accuracy ability to identify tolerances from drawings or technical information	micrometer, rulers, scale, tape measure, vernier, callipers
10.08 Trims parts.	knowledge of alignment standards such as edge distance, dimensions and required gap knowledge of required finish of edges such as chamfer and radius knowledge of cutting tools required to trim parts ability to fit part to assess trimming ability to determine allowance requirements ability to remove excess material ability to chamfer or radius edges	aviation snips, files, band saw, hack saw, rasp, rotary files, sanders, sanding blocks, shears

Sub-tasks	Enabling Objectives	Tools & Equipment
10.09 Drills holes in parts.	knowledge of tools required such as air drills, reamers, spot facer and countersink knowledge of drill bit types and sizes ability to locate and mark holes in accordance with drawings ability to select drill bits ability to operate hand air drill and drill press	air drill, drill press, drill bits, reamer, countersinks, spot facer, hole saws
10.10 Disassembles part.	knowledge of temporary fasteners knowledge of procedures and sequence to remove fasteners ability to remove fasteners	temporary fasteners, pliers, clamps
10.11 Dresses parts.	knowledge of finishing procedures for edges and holes knowledge of depth of countersink for specified fasteners ability to interpret drawings for finishing of edges and holes ability to remove sharp edges and burrs ability to produce chamfers, radius and 90 degree edges knowledge of primers	air drill, countersinks, files, rasps, sanding disc, drill press

Sub-tasks	Enabling Objectives	Tools & Equipment
10.12 Treats/primes parts.	knowledge of specific chemical treatments such as alodine and chromic acid knowledge of treatment procedures and sequence knowledge of safety procedures, equipment and protective clothing ability to prepare/clean surfaces ability to apply treatments ability to apply final coat or primer	brushes, cloth, abrasive pads, gloves, vats, mask, spray gun
10.13 Applies sealants to parts.	knowledge of types and functions of sealants and their applications knowledge of sealant's shelf-life working and curing times knowledge of sealant removal procedures ability to mix sealants (base and accelerator) ability to remove excess or deteriorated sealant ability to prepare surface for sealant application, such as masking, cleaning and surface preparation ability to follow direction for application of sealants	spatula, brushes, weigh scales, applicator gun
10.14 Bonds/welds parts.	knowledge of bonding procedures and their sequence knowledge of welding procedures	weigh scale, spatula, brushes, clamps, heat gun, spot welder

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of sequence of assembly for components	
	knowledge of bonding materials, such as adhesives and sealants	
	ability to prepare surface for bonding, such as cleaning and priming	
	ability to mix and apply bonding material	
	ability to set up and operate spot welding equipment	
10.15 Installs permanent fasteners.	knowledge of types and sizes of fasteners	rivet guns, bucking bar, wrenches, specialized installation tools/guns, Allen key, screwdrivers, socket wrenches & ratchet, snap, hammer, drift punch
	knowledge of hole size required for fasteners	
	knowledge of installation procedures	
	knowledge of tolerances for installed fastener	
	ability to interpret SRM and/or drawings for fastener types and finish of holes	
	ability to interpret NAS-523 rivet code	
	ability to select fasteners, such as type, length and direction	
	ability to determine acceptable substitute fasteners	
	ability to identify defective fasteners	
	ability to operate installation tools	

Sub-tasks	Enabling Objectives	Tools & Equipment
10.16 Removes jigs/ fixtures.	knowledge of types of jigs and holding fixtures knowledge of sequence to remove jigs and holding fixtures from assembly ability to calibrate jigs and fixtures ability to store jigs and fixtures ability to protect jigs and fixtures against corrosion	clamps, jacks, crane, vice, wrenches, screwdrivers

BLOCK B SHEET METAL STRUCTURES

Task 11 Repairs/replaces/modifies metal alloy structures.

Trend: Towards the introduction of new alloys and the greater use of lighter materials. The introduction of superior adhesive to bond metals. The greater use of milled skins.

Sub-tasks	Enabling Objectives	Tools & Equipment
11.01 Conducts dye penetrant test.	knowledge of dye penetrant techniques knowledge of cleaning requirements for surfaces knowledge of dye developing agents ability to chemically clean material ability to dry material ability to apply dye by brush/spray	brushes, spray equipment, wipers

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to remove excess dye	
	ability to identify cracks	
	ability to time soaking process	
	ability to spray/brush on developer	
11.02 Removes damaged parts.	knowledge of procedures for part removal	drills, cutting tools, wrenches, hammer, punches, heat gun, abrasives, bucking bars, scrapers
	knowledge of fastener removal	
	knowledge of bond removal processes	
	ability to remove fasteners such as bolts, rivets and blind rivets	
	ability to remove bonding agents with liquid nitrogen, dry ice or heat guns	
	ability to cut materials such as aluminum and steel	
11.03 Reinforces longerons, skins, panels and applies sealants.	knowledge of metals used for reinforcing	drills, rivet gun, wrenches, abrasives, specialized fastening tools, bonding material, mixing tools, hand shears, mechanical shears, router, rotary files, files
	knowledge of drilling procedures	
	knowledge of structural repair standards	
	knowledge of fastener selection and installation requirements	
	knowledge of manufacturer's instructions for measuring, mixing and applying sealants	

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of reinforcing techniques such as doubling and sandwiching	
	knowledge of paint removal and application procedures	
	ability to drill and install fasteners	
	ability to measure, mix and apply sealants	
	ability to install doublers	
	ability to seal doublers (pressurized aircraft only)	
	ability to deburr sharp edges	
	ability to heat-treat metal (heat or alodine)	
	ability to remove and apply primer	
11.04 Splices longerons, panels, skins and applies sealants.	knowledge of cutting techniques such as sawing and shearing	saws, shears, routers, drills, rivet guns, bucking bars, air regulator, mixing tools, ventilation fans
	knowledge of machining techniques	
	knowledge of drilling techniques	
	knowledge of doubler reinforcing methods	
	knowledge of sealing techniques	
	knowledge of paint removal and application procedures	
	ability to cut away damaged areas	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to fabricate a splice (plug)	
	ability to install and reinforce doublers	
	ability to seal repairs	
11.05 Replaces longerons, skins, panels and applies sealants.	knowledge of fastener removal and installation techniques	saws, shears, routers, drills, rivet guns, bucking bars, ventilation fans, air regulator, mixing equipment, jig, alignment tools
	knowledge of techniques for removal of damaged parts	
	knowledge of fabrication techniques for new parts	
	knowledge of methods for bonding and de-bonding surfaces	
	knowledge of need and use of jig and associated tools to align parts and drill and ream critical hole locations	
	ability to fit new parts	
	ability to seal parts	
	ability to assess accuracy of completed work	
11.06 Reinforces castings, doors, beams and mounts.	knowledge of machining techniques	drills, rivet gun, wrenches, abrasives, specialized fastening tools, bonding material, mixing tools, hand shears, mechanical shears, router, rotary files, files
	knowledge of cutting and routing techniques	
	knowledge of methods for bonding and de-bonding surfaces	
	knowledge of fastener removal and installation techniques	
	knowledge of paint removal and application procedures	

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of hinge selection and installation procedures	
	ability to drill and install fasteners	
	ability to mix/measure and apply sealants/paint/ remover	
	ability to machine doublers	
	ability to measure, cut and shape doublers to size	
	ability to install and seal doublers	
	ability to deburr sharp edges	
	ability to heat-treat metal	
	ability to chemically treat metal	
	ability to prepare surfaces for bonding	
11.07 Flap-peens castings and/or forging to rework surfaces and holes.	knowledge of methods for flap-peening various alloys	flap-peening equipment, hand drills
	ability to identify areas on casting which requires flap-peening	
	ability to operate flap-peening equipment	
11.08 Splices beams and tracks.	knowledge of machining techniques	saws, shears, routers, drills, rivet guns, bucking bars, air regulator, mixing equipment
	knowledge of cutting and routing techniques	
	knowledge of drilling techniques	
	knowledge of doubler reinforcing techniques	

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of sealing techniques	
	knowledge of paint removal and application procedures	
	ability to machine beams and tracks	
	ability to cut away damaged areas	
	ability to fabricate a splice	
	ability to install and reinforce doublers	
	ability to seal repairs	
11.09 Replaces castings, doors, beams and mounts.	knowledge of machining techniques	drills, rivet guns, bucking bars, wrenches, abrasives, specialized fastening tools, bonding material, mixing tools, hand shears, mechanical shears, router, rotary files, files
	knowledge of cutting and routing techniques	
	knowledge of methods for bonding and de-bonding surfaces	
	knowledge of fastener removal and installation techniques	
	knowledge of paint removal and application procedures	
	ability to select/construct and set up jigs and fixtures	
	ability to drill and install fasteners	
	ability to measure/mix and apply sealants/paints/ remover	
	ability to measure, cut and shape metal alloy structures	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to deburr sharp edges	
	ability to heat-treat metal	
	ability to chemically treat metal	
	ability to prepare surfaces for bonding	
11.10 Reworks seats, lavatories, galleys and air stairs.	knowledge of mechanical assembly and disassembly procedures	drills, rivet guns, bucking bars, wrenches, abrasives, specialized fastening tools, bonding material, mixing tools, hand shears, mechanical shears, router, rotary files, files, caps/plugs, tags, ear muffs, safety goggles
	knowledge of types of corrosion and corrosion assessment methods	
	knowledge of surface treatments	
	knowledge of metals used for reinforcing	
	knowledge of fastener selection and installation requirements	
	knowledge of reinforcing techniques such as doubling and sandwiching	
	knowledge of paint removal and application procedures	
	ability to drill and install fasteners	
	ability to measure, mix and apply sealants	
	ability to measure out, shape and install doublers	
	ability to seal doublers (pressurized aircraft only)	
	ability to deburr sharp edges	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to treat metals (heat/alodine)	
	ability to remove and apply paint	
11.11 Replaces seats, lavatories, air stairs and galleys.	knowledge of installation techniques for seats, lavatories, air stairs and galleys	cutting tools, hammer, wrenches, screwdrivers, sheet metal tools, sealants
	knowledge of measuring, mixing and applying sealants	
	knowledge of removal and installation of fluid and air lines	
	ability to locate assemblies on aircraft	
	ability to trim, shim, fit and attach units to aircraft fuselage	
	ability to measure, mix and apply sealants	
	ability to plug/cap lines	
	ability to connect lines from component to aircraft system	
	ability to confirm installation and location	
	ability to test operation when completed (check clearances, operations, etc.)	
11.12 Replaces rod ends on transmission and engine mounts.	knowledge of jigs and measuring tools	jigs, drills, reamers, punches, hammer, deburring tools, bucking bars, ruler, vernier, callipers
	knowledge of types of fasteners	
	knowledge of rod end material	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to use/construct jigs	
	ability to determine rod end position	
	ability to position and drill new rod end	
	ability to drill out or remove fasteners	
	ability to select and replace fasteners	
11.13 Applies patches to cargo and cabin liners.	knowledge of size and thickness dimensions of available patches	ruler, tape measure, spatula, shears
	knowledge of prepared patch kits, limitations and gauge	
	knowledge of prepared patch application criteria and procedures	
	ability to clean damaged area	
	ability to position patch on damaged area	
	ability to trim, fit and install patch	
11.14 Replaces/rebalances control surfaces.	knowledge of manufacturers' specifications to rebalance	weights, weigh scales, knife edge, jig, level protractor
	knowledge of static balancing control surfaces	
	knowledge of weigh scales	
	knowledge of the dangers of handling lead and spent uranium	
	ability to position control surface on balancing jig	
	ability to attach balance weights to control surface	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to take readings of results ability to interpret readings	
11.15 Burnishes/polishes/ dresses skins.	knowledge of allowable damage and assessment procedure knowledge of burnishing, polishing and dressing procedures for metal alloys ability to select burnishing tools, abrasives and files ability to evaluate burnishing depth allowances	air drills, burnishing wheels, burnishing tools, plastic scrubbing pads, sanding discs, abrasives, files
11.16 Dresses out castings, forging and machined parts.	knowledge of allowable damage and assessment procedures knowledge of dress-out procedures for castings, forging and machined parts ability to select cutters, abrasives tools, abrasives and files ability to measure, grind and sand within specified limits ability to deburr sharp edges	air drills, rotary files, files, die grinders, sanding wheels, abrasives, plastic scrubbing pads
11.17 Dresses out damaged area.	knowledge of allowable damage and assessment procedure knowledge of dress-out procedures for specific areas ability to deburr sharp edges	air drills, rotary files, aircraft snips, files, plastic scrubbing pad, sandpaper, sanding discs, die grinder, abrasives

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to select abrasive tools, abrasives and files	
	ability to measure and remove damaged area within specified limits	
11.18 Stop-drills skins for small cracks.	knowledge of stop-drill procedures for cracks in various alloy skins	air drill, deburring tools, drill bits, magnifying glass, centre punches, hammer
	knowledge of limits for stop-drilling various alloys	
	ability to stop-drill specified areas	
	ability to measure and identify location of drill holes	
11.19 Patches skins flush/lap.	knowledge of direction of predominant stresses	air drills, rivet guns, aviation snips, files, rotary files, chassis punches, hammer, measuring scale, shears, brake, roller, shrinker, hole saws
	knowledge of patching techniques for various structures	
	knowledge of acceptable patches, dimensions and thicknesses	
	knowledge of patch limitations and required gauge increase	
	knowledge of patch application procedures	
	ability to follow directions in SRM	
	ability to fabricate patch	
	ability to determine riveting pattern	
	ability to install rivets	
	ability to add stiffeners to reinforce patch seam	

Sub-tasks	Enabling Objectives	Tools & Equipment
11.20 Weighs aircraft and carries out weight and balance computations.	knowledge of aircraft specifications and operating limitations knowledge of type approval knowledge of weight and balance requirements for various aircraft knowledge of ballast materials, location and installation methods knowledge of levelling requirements for aircraft knowledge of aircraft jacking points ability to use platform scales ability to use electronic load cells ability to drain fuel and oil systems ability to calculate loading conditions ability to differentiate between required and additional equipment ability to weigh aircraft ability to determine centre of gravity at a level flight attitude and if it is within limits ability to calculate for location and weight of ballast ability to remove/add temporary and permanent ballast ability to complete weight and balance report	scales, jacks, levelling equipment, screwdrivers, wrenches, pliers, hammer

Task 12 **Fabricates sheet metal parts.**

Trend: Towards the introduction of new alloys, superior adhesives to bond metals, and the greater use of milled skins and lighter materials.

Sub-tasks	Enabling Objectives	Tools & Equipment
12.01 Reads blueprints and drawings.	knowledge of types of blueprints and drawings, such as production, lofted, detailed, assembly, repair and sub-assembly knowledge of information contained in blueprints regarding finishes, scale, fasteners, materials, dimensions, tolerances, location, processes and standards knowledge of layout of drawings, such as views and orientation ability to verify dimensions/information ability to visualize three dimensional components in proper orientation ability to visualize stages/order of assembly ability to detect/recognize errors on drawings	vernier, callipers, measuring scale, compass
12.02 Refers to technical information.	knowledge of technical information contained in manufacturers' reference material, SRM, work/snag sheets, production permits, process standards, engineering bulletins and overhaul, maintenance, vendor and parts manual	

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of procedures, materials, fasteners, processes, tolerances and standards	
	ability to locate and identify information	
	ability to interpret information in order to sequence fabricating procedures	
	ability to comply with technical information	
12.03 Measures sample.	knowledge of use and types of measuring devices	measuring scale, micrometer, vernier, callipers, compass, protractor, contour gauge, depth gauge, telescoping gauge, plumb bob, chalk line, square, trammel points
	ability to read measurements	
	ability to select appropriate measuring devices	
	ability to record measurements	
	ability to operate measuring devices in order to maintain accuracy	
12.04 Tests sample.	knowledge of technical information and procedures	grinder, magnet, hardness testers, eddy-current testers, testing acids
	knowledge of types of sample materials and associated testing procedures for each	
	knowledge of tests, such as N.D.T., chemical and hardness	
	ability to perform/request tests and analyze material results	

Sub-tasks	Enabling Objectives	Tools & Equipment
12.05 Makes shop sketches.	knowledge of drafting procedures knowledge of acceptable repair procedures knowledge of major stress orientation knowledge of grain orientation knowledge of certification requirements ability to reproduce or produce samples, concepts and ideas to scale on paper	measuring scale, compass, drawing, pencils, rulers
12.06 Lays out pattern.	knowledge of layout procedures knowledge of blueprints and drafting procedures knowledge of types of materials and grain or orientation knowledge of measuring devices ability to select pattern material, such as mylar, aluminum, steel, wood, paper, pressboard and plastic ability to transfer information from blueprint or drawing to pattern ability to identify direction of grain orientation ability to use measuring devices	rulers, scribes, hole punches, centre punches, compass, layout paint, french curve, markers, trammel points

Sub-tasks	Enabling Objectives	Tools & Equipment
12.07 Prepares template.	knowledge of blueprints and drafting procedures knowledge of types of template materials, such as plastic, aluminum, steel, and wood knowledge of template preparation procedures and techniques knowledge of types and operation of measuring devices ability to transfer information from blueprint or drawing to pattern ability to select prescribed template material such as plastic, aluminum, steel and wood	band saw, shears, hole saws, files, high speed grinders, sanders, nibblers, rulers, scribes, drill press, router & bits, chassis punches
12.08 Prepares form blocks.	knowledge of types of form block materials such as steel, wood, plastics, rubber, fusible alloys and aluminum as well as combinations knowledge of friction reducing substances such as wax, oil and grease knowledge of types of form making equipment, such as hydraulic press, pneumatic press and forming hammer ability to form and fabricate block from the layout or sample ability to verify block dimensions from the layout or sample	grinder, saw, sander, drill, files, hammer, hydraulic press, pneumatic press, rulers, compass, square, trammel points

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to recognize the type of forming block required to work the type of material	
	ability to machine, drill, file and sand/polish form block material	
12.09 Prepares mould.	knowledge of types of mould materials, such as plastics, metal, fusible alloys, rubber, lead and composite	grinder, saw, sander, drill, files, hammer, hydraulic press, pneumatic press, vacuum, rulers, square, compass, trammel points
	knowledge of friction reducing substances such as wax, oil and grease	
	knowledge of mould preparation techniques	
	knowledge of types of equipment, such as vacuum, hydraulic and pneumatic presses	
	ability to form a mould from the layout or sample using materials such as plastics, metal, fusible alloys, rubber, lead and composite	
	ability to mix casting resins allowing correct curing times and conditions	
	ability to verify dimensions of the mould	
	ability to specify the type of forming mould required to work a specific type of material	

Sub-tasks	Enabling Objectives	Tools & Equipment
12.10 Selects material for part.	knowledge of types of materials required knowledge of comparative strength of aircraft materials knowledge of comparison sample test results knowledge of possible modifications from manufacturer, service bulletin or engineers drawing knowledge of technical information with regard to material substitution ability to apply formula for material substitution ability to read results from comparison test sample	micrometer, vernier, callipers, rulers
12.11 Cuts material to size.	knowledge of types of material knowledge of marking procedures as specified by standards or template knowledge of cutting tools and use knowledge of types of material which are sensitive to cutting and shearing such as Titanium ability to select type of material ability to measure, mark or scribe material to be cut ability to drill, cut and punch materials ability to operate tools	shears, power shears, saws, hole saws, snips, nibblers, routers, cutting discs, drills, chassis punches

Sub-tasks	Enabling Objectives	Tools & Equipment
12.12 Sands/deburrs sheet metal edges and holes.	knowledge of types of material knowledge of minimum and maximum metal removal standards knowledge of material hardness ability to select and use abrasive tools ability to sand/deburr desired amount ability to polish sheet metal ability to draw file	files, abrasives, countersink, deburring tool
12.13 Straight bends sheet metal in a brake.	knowledge of types of material knowledge of brake operation knowledge of bend allowance formulae knowledge of K-chart and/or J-chart knowledge of bending procedures (radius) knowledge of grain orientation knowledge of layout procedures knowledge of measuring devices ability to use sheet metal brake tools	rulers, square, dividers, compass, bending brakes, box & pan, straight brake, finger brake, hydraulic brake, pneumatic brake, press brake

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to calculate bend allowances	
	ability to interpret K-chart and/or J-chart	
	ability to use measuring devices	
12.14 Joggles sheet metal material.	knowledge of layout procedures	rulers, vice, joggling rollers, bending brake, sheet rollers, hydraulic presses, pneumatic presses, hammer, press brake
	knowledge of types of material	
	knowledge of material thicknesses and grain orientation	
	ability to use measuring devices	
	ability to use joggling equipment	
	ability to make joggling tools	
12.15 Rolls sheet metal.	knowledge of types of tools and equipment required to roll sheet metal	straight rollers, slip rollers, hydraulic press, pneumatic press, mallets, vacuum source, duct tape, plastic bags
	knowledge of using vacuum when rolling long leading edges	
	knowledge of types of materials	
	knowledge of layout procedures	
	knowledge of grain orientation	
	ability to read blueprints and drawings	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to lay out patterns	
	ability to select rolling tools	
	ability to use rollers	
	ability to form long leading edges with vacuum	
12.16 Crown rolls sheet metal.	knowledge of blueprints and technical information	crown roller
	knowledge of types of material	
	knowledge of layout procedures	
	knowledge of crown rolling procedures	
	knowledge of safety practices when crown rolling sheet metal	
	knowledge of hardening of material through cold working	
	ability to lay out patterns	
	ability to select specific wheeling tools	
	ability to fit parts to template or aircraft structure	
	ability to trim excess material	
12.17 Stretches/shrinks/ crimps sheet metal material.	knowledge of types of materials	stretching tools, shrinking tools, crimping tools, presses, rivet gun, beading wheel, rollers, files, snips, deburring tools, planishing hammers, mallets
	knowledge of types of stretching, shrinking and crimping tools	
	knowledge of grain orientation	

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of layout procedures	
	knowledge of templates and patterns	
	knowledge of safety practices when stretching, shrinking and crimping sheet metal	
	knowledge of heat-treat procedures	
	ability to select and use stretching, shrinking and crimping tools and equipment	
	ability to stretch, shrink and crimp aircraft materials without weakening the structure	
	ability to lay out patterns and templates	
	ability to fit parts	
12.18 Mills/routs sheet metal material.	knowledge of types of material to be milled and routed	milling equipment, routing equipment, spot facers, cutting bits, precision measuring devices
	knowledge of milling and routing procedures	
	knowledge of types of mechanical milling and routing equipment	
	knowledge of routing patterns and templates	
	knowledge of chemical milling processes	
	ability to select and use milling and routing tools	
	ability to route using templates and patterns	

Sub-tasks	Enabling Objectives	Tools & Equipment
12.19 Saws sheet metal material.	knowledge of layout patterns knowledge of types of sheet metal materials and specific thicknesses of each knowledge of cutting tool orientation and operation knowledge of lubricating and cooling procedures knowledge of safety procedures and equipment ability to select proper tools, cutting speeds and cutting blades ability to select proper lubricant and coolants ability to lay out patterns	hacksaw, bandsaw, radial saw, table saw, hole saws, cutting blades, jigsaw, sabre saw
12.20 Presses sheet metal.	knowledge of types of sheet metal materials knowledge of types of presses and their operation knowledge of metal forming equipment, such as male and female dies knowledge of lubricants and release agents knowledge of safety procedures related to hydraulic and pneumatic presses ability to fabricate dies ability to set up dies ability to position material in press ability to set up and operate presses	hydraulic press, pneumatic press, hand press, arbour press, forming dies, hydroform press

Sub-tasks	Enabling Objectives	Tools & Equipment
12.21 Beads sheet metal material.	knowledge of types of sheet metal materials and beading techniques knowledge of beading processes knowledge of beading equipment knowledge of safety practices when beading sheet metal ability to select type of material to be beaded ability to select appropriate dies ability to operate beading tools and equipment ability to heat-treat sheet metal	beading tools, beading equipment, dies
12.22 Drills sheet metal material.	knowledge of layouts and patterns knowledge of types of sheet metal materials and associated drilling procedures knowledge of types and capacities of drilling equipment knowledge of drill size charts knowledge of cooling procedures and lubricants	drill motor, drill bits, drill press, hand drill, drill jigs
12.23 Punches sheet metal material.	knowledge of types of sheet metal materials knowledge of types of punches and operation	press punch, centre punch, chassis punches, hand punch

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to select types of punches	
	ability to use punch press	
	ability to deburr punch holes	
12.24 Rivets sheet metal material.	knowledge of types of material to be riveted	rivet gun, bucking bars, blind riveter, pneumatic squeeze riveter, hand squeezer, hammer, rivet sets (snaps)
	knowledge of types of riveting tools and rivets	
	knowledge of NAS-523 rivet code	
	knowledge of wet or dry assembly and installation procedures	
	knowledge of types and uses of sealants	
	knowledge of annealed rivets	
	ability to interpret NAS-523 rivet code	
	ability to select and install rivets	
	ability to select and operate riveting tools and equipment	
	ability to mix and apply sealants	
12.25 Bonds sheet metal material.	knowledge of types of materials and bonding application for each	weigh scale, spatula, pneumatic applicators, hand applicators, roller, brushes, respirator, heat source, vacuum
	knowledge of bonding resins	
	knowledge of clean room requirements	
	knowledge of surface preparation	

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of mixing procedures and correct proportions	
	knowledge of measuring (weight, volume)	
	ability to prepare surfaces	
	ability to select bonding materials	
	ability to mix bonding resins	
	ability to apply bonding resins	
12.26 Dimples sheet metal material.	knowledge of types of sheet metal materials	dimpling dies, hand squeezers, pneumatic squeezers, hammer, coin dimpler, hot-dimpler, 10X magnifying glass
	knowledge of radius and coin dimpling processes	
	knowledge of tooling and dies for dimpling	
	knowledge of hot-dimpling process and machinery	
	ability to use dies while dimpling	
	ability to select dimpling tools	
	ability to select and use hand and bench tools for dimpling	
	ability to inspect for failed dimples	
	ability to hot-dimple sheet metal	

Sub-tasks	Enabling Objectives	Tools & Equipment
12.27 Countersinks sheet metal material.	knowledge of types of sheet metal materials knowledge of countersink procedures knowledge of countersink angles knowledge of depth of countersink for specified fasteners ability to select and use countersink tools and bits ability to match countersink angles to required rivets	drill motor, countersink bit, microstop countersink
12.28 Flanges sheet metal around holes.	knowledge of types of sheet metal materials knowledge of form blocks knowledge of heat-treat procedures ability to select and use form blocks and flanging dies ability to use hydraulic and hand presses ability to heat-treat sheet metal	flanging dies, hydraulic press, hand press, form blocks, flanging machines

BLOCK C COMPOSITE STRUCTURES

Task 13 Repairs/modifies composite structures.

Trend: Towards the introduction of more composites in the manufacturing of aircraft. Towards new composite materials with different properties and strengths. Towards changes in standard repair procedures for composites.

Sub-tasks	Enabling Objectives	Tools & Equipment
13.01 Obtains repair/ modification information from technical resources.	knowledge of information contained in blueprints, sketches and drawings knowledge of technical and aircraft terminologies knowledge of types, layouts and structure of technical manuals ability to determine tolerances, sequence of repair and material ability to consult engineering department or manufacturer regarding repair procedure	
13.02 Removes damaged part.	knowledge of manufacturer's procedures to remove part knowledge of aircraft location identification code knowledge of tools required to remove part knowledge of fasteners ability to remove fasteners	ratchets, sockets, wrenches, screwdrivers, cutters, air drills, drill bits, hammer, punches, scrapers, grinders, air routers, router bits, dust removal equipment, reciprocating saw, portable circular saw, skin peeling tools

Sub-tasks	Enabling Objectives	Tools & Equipment
13.03 Sands, grinds, routs damaged area.	knowledge of composition of material in damaged area knowledge of appropriate sander speeds and grits of abrasive materials knowledge of tolerances and limits regarding damaged area knowledge of safety procedures, equipment and protective clothing ability to measure depth and area of damage so as not to exceed limits ability to select abrasive material ability to operate sanders, grinders and routers	ruler, callipers, depth gauge, sanders, router, bits, air drill, grinders, scrapers, dust removal equipment, routing templates, hole saws
13.04 Step/taper sands plys.	knowledge of manufacturer's procedures for preparing composite surfaces knowledge of limits and tolerances for composite surfaces knowledge of tools required to step or taper sand composite plys knowledge of safety procedures, equipment and protective clothing ability to accurately measure steps and tapers ability to operate sanding tools and equipment ability to recognize surface changes due to overheating	sanding discs, mandrills, dies, grinders, ruler, depth gauge, callipers, dust removal equipment

Sub-tasks	Enabling Objectives	Tools & Equipment
13.05 Cuts and trims replacement core.	knowledge of types of cores such as honeycomb, aluminum, paper, balsa and foam knowledge of standard and special tools such as valve-stem cutters ability to select core material ability to measure size and thickness of replacement core ability to trim/taper honeycomb replacement cores with valve-stem cutters ability to operate cutting tools ability to cut core material ability to fit/align core material ability to handle and maintain cleanliness requirements of core material	sander, router, bandsaw, draw knife, snips, razor blades, ruler, combination square, callipers, tape measure, die grinder, valve-stem cutters
13.06 Bonds replacement core.	knowledge of types of bonding material knowledge of operation of weigh scales knowledge of cleaning techniques such as vacuuming and scrubbing with acetone knowledge of core ribbon direction knowledge of vacuum bagging and bonding procedure to cure bond	sander, vacuum cleaner, hot bonding control unit, heat blanket, heat lamp, thermometer, heat gun, air blower, spatula, mixing cup, weigh scales, fan/air circulation

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of curing times	
	knowledge of sample history, testing and storage requirements	
	ability to mix bonding resins in specified proportions	
	ability to perform water break test	
	ability to butter edge of plug and repair area with resin or use foaming adhesive	
	ability to match core ribbon direction of plumb bob to that of existing structure	
	ability to apply vacuum and heat to repair area to cure resins	
	ability to sand to specified contour	
13.07 Applies potting compound to damaged area.	knowledge of potting compounds and their application	sander, vacuum cleaner, hot bonding control unit, heat blanket, heat lamp, thermometer, heat gun, air blower, spatula, mixing cup, weigh scales
	knowledge of weigh scale operation	
	knowledge of fillers, such as micro balloons or chopped fibres	
	knowledge of damage limits within which potting compound can be employed	
	knowledge of vacuum bagging and bonding procedures to cure bond	
	knowledge of curing times	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to mix potting compounds to specified proportions including micro balloons or chopped fibres	
	ability to perform water break test	
	ability to apply vacuum and heat to repair area to cure potting compound	
	ability to sand to specified contour	
13.08 Makes patterns for repair plys.	knowledge of warp fibre orientation of repair material	ruler, tape measure, scissors, rotary knife
	ability to make patterns of damaged area using transparent material such as bagging film or kraft paper	
	ability to number patterns in sequence	
	ability to mark warp direction	
13.09 Applies resin to repair cloth.	knowledge of resin types	squeegee, rollers
	knowledge of weigh scale operation	
	knowledge of repair cloths such as fibreglass, carbon fibre and aramids	
	ability to select appropriate resin	
	ability to saturate repair cloth with resin by sandwiching resin and repair material between two pieces of plastic	
	ability to remove excess resin including air bubbles using rollers and squeegees	

Sub-tasks	Enabling Objectives	Tools & Equipment
13.10 Lays out and cuts repair plys.	knowledge of composite repair materials such as aramid, fibreglass and carbon fibre knowledge of properties and storage conditions for prepregs knowledge of warp clock ability to select materials for repair ability to transfer pattern to repair material with correct fibre orientation ability to cut repair plys precisely from pattern ability to ensure pattern sequence ability to match fibre orientation to warp clock	scissors, rotary knife
13.11 Lays up repair plys.	knowledge of layup sequence ability to maintain clean repair area ability to apply repair pieces in correct sequence and warp fibre orientation ability to remove air bubbles and excess resin	roller, squeegee
13.12 Cures repair plys with hot bonding process.	knowledge of operation of hot bonding unit knowledge of vacuum bagging material knowledge of programing of hot bonding unit knowledge of ramp-up and ramp-down times	hot bonding control unit, vacuum gauge, vacuum sniffer, heat blanket, recording equipment, timer

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to apply in sequence: peel ply, thermocouple, caul plate, heat blanket, breather, vacuum sniffer, sealant tape, vacuum bagging and vacuum gauge to damaged area	
	ability to access manuals to obtain correct temperature, duration and vacuum pressures	
	ability to set controller of hot bonding unit to correct ramp-up/ramp-down times, curing temperature, duration and vacuum pressures	
	ability to program and activate hot bonding unit	
13.13 Cures repair plys with cold bonding process.	knowledge of types and curing characteristics of cold bonding resins	weights, sandbags, weigh scales, spatulas, mixing cups
	knowledge of mixing room temperature resins	
	ability to mix/apply room temperature resins in proper proportions	
	ability to select and apply peel ply to repair while curing	
	ability to distribute weight evenly over repair area	
13.14 Performs tap test of repair area.	knowledge of procedure to test composite repairs for voids and delamination	metallic mini hammer, coin
	ability to interpret sound discrepancies across repair area	
	ability to interpret test results	

Sub-tasks	Enabling Objectives	Tools & Equipment
13.15 Arranges for non-destructive testing.	knowledge of appropriate non-destructive testing for composite components such as ultrasound and x-ray knowledge of non-destructive testing services ability to interpret results of non-destructive tests	
13.16 Removes excess resin.	knowledge of sanding techniques such as disc sanding and block sanding knowledge of safety procedures, equipment and protective clothing ability to operate sanding tools and equipment	disc sander, sanding discs, sanding blocks, die grinder, dust removal equipment
13.17 Applies primer surfacer.	knowledge of types of primers knowledge of types of sanders such as disc sander and block sander knowledge of spraying equipment knowledge of safety procedures, equipment and protective clothing ability to operate disc sander ability to inspect visually for pits and voids ability to shape damage area to original contour ability to select appropriate primers ability to operate spray gun ability to spray/brush primer on repair area	disc sander, block sander, spray gun, contour blocks, paint brush, dust removal equipment

Sub-tasks	Enabling Objectives	Tools & Equipment
13.18 Paints/coats surface.	knowledge of paints and surface coatings such as tedlar knowledge of ultraviolet barrier paints knowledge of spray equipment knowledge of safety procedures, equipment and protective clothing ability to select appropriate paints ability to apply surface coat to repaired and adjoining area ability to remove air bubbles during application ability to trim coats to match existing paint scheme	scissors, rollers, spatula, spray gun, respirator, extraction fan

Task 14 **Fabricates composite parts.**

Trend: Towards introduction of more composites in the manufacturing of aircraft. Towards new composite materials with different properties and strength.

Sub-tasks	Enabling Objectives	Tools & Equipment
14.01 Consults manufacturer and engineering department.	knowledge of regulations, standards for the fabrication of aircraft parts/structures knowledge of when to seek approval for jigs and fixtures	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to develop contacts with manufacturers and engineering departments	
	ability to interpret information from manufacturer/engineering department such as drawings, specifications and technical information	
14.02 Takes measurements of sample.	knowledge of measuring equipment such as compass, ruler, tape measure, vernier, callipers and micrometers	compass, ruler, tape measure, contour block, vernier, callipers, micrometer, trammel points
	ability to operate measuring equipment	
	ability to record measurements/dimension	
	ability to prepare shop sketch	
14.03 Creates a master model.	knowledge of materials acceptable for master models	planer, sander, milling machine, scribe, height gauges, marking gauges, vernier, lathe, wax, mould release
	knowledge of model/mould making techniques	
	ability to plan and organize production of models	
	ability to select size and build up material for making mould	
	ability to lay out materials	
	ability to cut material to basic shape within specified tolerances	
	ability to mark and prepare joint lines and taper	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to prepare surfaces of master model	
	ability to apply surface coat of sanding sealer to model	
	ability to wax/seal surface of model	
	ability to apply mould release agents	
14.04 Produces a mould from a master model or sample.	knowledge of mould construction materials such as wood, plaster of paris, moulding resin or glass cloth	common hand tools, mixing cups, spatula, sanding blocks, brushes, measuring tape
	ability to build a support frame	
	ability to fabricate and fill blocks or reinforcing core	
	ability to apply surface coatings	
	ability to mix resins and catalysts	
	ability to apply moulding resins	
	ability to lay up reinforcing material to surface coat	
	ability to apply plaster of paris/mould cement to surface coat	
	ability to extract model from mould	
	ability to cure resin moulds	
	ability to inspect and repair surface of moulds	

Sub-tasks	Enabling Objectives	Tools & Equipment
14.05 Makes pattern for plys.	knowledge of fibre orientation ability to select pattern material such as bagging film or kraft paper ability to interpret and transfer measurements from sample or drawing to pattern material ability to cut pattern material to size specifying correct fibre orientation and sequence of application	ruler, tape measure, scissors, rotary knife
14.06 Cuts plys for size.	knowledge of composite materials such as aramid, fibreglass and carbon fibre ability to select and prepare materials for fabrication such as resin and cloth ability to apply resin to cloth ability to match pattern from sample or drawing to material with correct fibre orientation ability to cut cloth material precisely from pattern ability to ensure pattern sequence	scissors, rotary knife
14.07 Prepares mould.	knowledge of release agents such as parting film and waxes ability to clean and polish mould ability to select appropriate release wax	brushes, cheesecloth, spray gun, extractor fan

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to select release/ parting film	
	ability to coat mould with parting film	
14.08 Applies gel coat.	knowledge of types of gel coats	spray equipment, rollers, brushes
	knowledge of application systems for gel coats	
	ability to select appropriate gel coat	
	ability to uniformly brush/ spray/roll gel coat to mould surface	
14.09 Lays up initial plys.	knowledge of types of film adhesives	roller, spatula, squeegee
	knowledge of layup sequence	
	ability to apply composite plys in correct sequence and orientation	
	ability to shape layup to mould	
	ability to remove air bubbles and excess resin	
14.10 Inserts core.	knowledge of film adhesives	
	ability to select appropriate adhesives such as 250°F and 350°F cure	
	ability to correctly position core on layup plys according to blueprints or sample	

Sub-tasks	Enabling Objectives	Tools & Equipment
14.11 Lays up final plys.	knowledge of types of film adhesives	roller, spatula, squeegee
	knowledge of layup sequence	
	ability to apply composite plys in correct sequence and orientation	
	ability to remove air bubbles and excess resin	
14.12 Cures plys with hot bonding process.	knowledge of operation of hot bonding unit	hot bonding control unit, vacuum gauge, vacuum sniffer, heat blanket, autoclave, curing oven, recording equipment, timer
	knowledge of vacuum bagging materials	
	knowledge of autoclaves and curing ovens	
	ability to apply in sequence: peel ply, thermocouple, caul plate, heat blanket, breather, vacuum sniffer, sealant tape, vacuum bagging and vacuum gauge	
	ability to access manuals to obtain correct temperature, duration and vacuum pressures	
	ability to set controller of hot bonding unit to correct ramp-up/ramp-down times, curing temperature, duration and vacuum pressures	
	ability to program and activate hot bonding unit	
14.13 Cures plys with cold bonding process.	knowledge of types and curing characteristics of cold bonding resins	weights, sandbags, weigh scales, spatulas, mixing cups
	knowledge of mixing room temperature resins	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to mix and apply room temperature resins in proper proportions	
	ability to distribute weight evenly over repair area	
14.14 Performs tap test.	knowledge of procedure to test composite repair for voids and delamination	hammer, coin
	ability to interpret sound discrepancies across repair area	
	ability to interpret test results	
14.15 Arranges for non-destructive testing.	knowledge of appropriate non-destructive testing for composite components such as ultrasound, x-ray, etc.	
	knowledge of non-destructive testing services	
	ability to interpret results of non-destructive tests	
14.16 Trims part.	knowledge of cutting tools such as sanders, double helix router bits and bandsaw	sander, die grinder, double helix router bits, bandsaw, disc sander, bradpoint drill bit
	knowledge of safety procedures, equipment and protective clothing	
	ability to select and operate appropriate cutting tools	
	ability to remove excess material	

Sub-tasks	Enabling Objectives	Tools & Equipment
14.17 Applies primer.	knowledge of types of primers knowledge of types of sanders such as disc sander and block sander knowledge of spray equipment ability to operate disc sander ability to inspect visually for pits and voids ability to shape damaged area to original contour ability to select appropriate primers ability to operate spray gun ability to spray/brush primer on repair area	disc sander, block sander, spray gun, contour blocks, paint brush, die grinder, dust removal equipment
14.18 Paints/coats surfaces.	knowledge of paints and surface coatings knowledge of ultraviolet barrier paints knowledge of spray equipment knowledge of safety procedures, equipment and protective clothing ability to select appropriate paints ability to apply surface coat to fabricated part and adjoining area ability to remove air bubbles during application ability to match new paint with existing paint scheme	scissors, rollers, spatula, spray gun, respirator, extraction fan

BLOCK D FABRIC AND WOOD REPAIR

Task 15 Re-covers/repairs fabric surfaces.

Trend: Towards the use of synthetic materials and coatings and away from natural fibres and nitrate dopes.

Sub-tasks	Enabling Objectives	Tools & Equipment
15.01 Refers to technical information.	knowledge of technical information contained in manufacturers' reference material, SRM, work/snag sheets, production permits, process standards, engineering bulletins and overhaul, maintenance, vendor and parts manual knowledge of procedures, materials, fasteners, processes, equipment, tolerances and standards ability to identify and locate information ability to interpret information in order to sequence procedures ability to comply with technical information ability to read and utilize information in technical information	
15.02 Conducts fabric tests in the field.	knowledge of minimum acceptable limits knowledge of laboratory fabric testing ability to perform test as described in technical information	Maule tester, Seyboth tester

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to interpret test results such as colour band indications (Seyboth)	
	ability to read p.s.i. indication on Maule tester	
	ability to recognize possible deterioration areas	
	ability to supply suitable fabric specimen for laboratory testing	
15.03 Repairs fabric surfaces.	knowledge of repair procedures	pinking shears, abrasives, sanding block, sanders, brush and spray equipment, needles, putty knife, scissors, extractor fan
	knowledge of properties of existing materials	
	knowledge of surface condition and preparations	
	knowledge of sewing patches to existing fabric	
	ability to wet sand	
	ability to remove/roughen exterior finish	
	ability to clean surface to be patched	
	ability to sew patch on to existing fabric with baseball stitching	
	ability to apply adhesives	
	ability to apply coatings	
15.04 Lap splices fabric surface. (doped-on method)	knowledge of lap-splice patching procedures	pinking shears, abrasives, sanding block, sanders, brush and spray equipment, extractor fan
	knowledge of properties of existing materials	
	knowledge of safety equipment required	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to wet sand	
	ability to remove/roughen exterior finish	
	ability to clean surface to be patched	
	ability to use tools and safety equipment	
	ability to apply adhesives	
	ability to apply coatings	
	ability to place reinforcing tapes in proper sequence	
15.05 Attaches fabric and reinforcing tapes to airframe.	knowledge of fastening or attaching methods	iron cloths, shears, paint brush, pop riveter, screwdrivers, sewing needles, T-pins, sewing machine, pneumatic drill, drill bits, soldering iron, beeswax
	knowledge of identification markings of certified fabrics	
	ability to rib stitch	
	ability to glue/bond fabric, fasten fabric with pop rivets, fasten with clip fasteners and fasten fabric with screws	
	ability to apply reinforcing tapes	
	ability to shrink within guidelines	
	ability to apply capstrip tape	
	ability to recognize fabric warp directions	
15.06 Shrinks fabric.	knowledge of shrinking techniques	iron, spray misting equipment (water)
	knowledge of behaviour of covering fabrics (cotton versus synthetics)	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to operate electric iron	
	ability to operate water misting equipment	
15.07 Rib stitches fabric to ribs.	knowledge of rib stitching techniques and procedures	scale/ruler, marker, sewing needles, light source holding fixture, scissors/shears, beeswax
	knowledge of all straight and curved needle types	
	knowledge of effects of slip-stream	
	knowledge of "never-exceed-speed" of aircraft model	
	ability to identify and tape sharp edges	
	ability to lace fabric covering to aircraft structure	
	ability to lay out fabric in accordance with repair procedures and standards	
	ability to apply beeswax	
15.08 Dopes fabric.	knowledge of product manufacturer's instructions	brushes, spray equipment, air extractors, mixing containers, stirring/agitating equipment
	knowledge of nitrate dopes and thinners	
	knowledge of butyrate dopes and thinners	
	knowledge of synthetic dopes and thinners	
	knowledge of military specifications for aircraft fabric finishes	
	ability to identify types of dopes and thinners	
	ability to calculate and add required amount of thinner	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to air spray dopes evenly	
	ability to brush coat dopes evenly	
15.09 Fills fabric weave and sands doped surfaces.	knowledge of dope application and sanding methods	brushes, spray equipment, abrasives, grounding wires, extractor fan, stirring/agitating equipment
	knowledge of static electricity build-up	
	ability to mix fillers into dope	
	ability to brush dope/ filler to weave	
	ability to spray dope/ filler to weave	
	ability to recognize fully filled weave	
	ability to smooth out between coats of filler	
	ability to electrically ground aircraft/component	
15.10 Applies UV barrier and applies final finish.	knowledge of UV barrier application techniques	spray equipment, abrasive paper, brushes, mixing container, extractor fan, stirring/agitating equipment
	knowledge of effect of UV radiation on fabric	
	knowledge of various UV barriers	
	ability to mix barrier to dope	
	ability to spray coatings and brush coatings	
	ability to smooth out with dry abrasive paper	
	ability to install drain grommets	
	ability to apply finish coatings	

Task 16 **Inspects/repairs wood structures.**

Trend: Towards fewer wooden structures and the use of laminated wood and synthetic resin glues.

Sub-tasks	Enabling Objectives	Tools & Equipment
16.01 Refers to technical manuals.	knowledge of technical information contained in manufacturers' reference material, SRM, work/snag sheets, production permits, process standards, engineering bulletins and overhaul, maintenance, vendor and parts manual knowledge of procedures, materials, equipment, fasteners, processes, tolerances and standards ability to identify and locate information ability to interpret information in order to sequence procedures ability to comply with technical information	
16.02 Inspects structures for deterioration.	knowledge of effects of dry rot, cracks and compression failure knowledge of glue deterioration ability to recognize onset and development of deterioration ability to recognize dry rot cracks and compression failures	mirror, light source, magnifying glass
16.03 Selects and replaces materials for wood structures.	knowledge of aircraft quality wood species knowledge of permissible replacement wood species	saws, planes, drills, glue pot, brushes, C-clamps, holding fixtures

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of permissible grain slope deviation	
	knowledge of aircraft quality glues	
	knowledge of wood drying procedures, such as air kiln or dry kiln	
	knowledge of average moisture content in aircraft wood	
	ability to prepare wood surface for gluing	
	ability to saw, plane, drill and glue wood	
	ability to prepare a scarf joint	
	ability to recognize natural slope of wood grain	
	ability to select aircraft quality wood	
16.04 Splices/patches/ scarves/laminates/ bends and reinforces wood structures.	knowledge of splicing and patching techniques	saws, planes, drills, glue pot, brushes, C-clamps, holding fixtures, tacks, hammers, rasps, abrasives
	knowledge of spar splicing standards and limitations	
	knowledge of types of glues that meet MIL specification requirements	
	ability to select woods for splicing and patching, such as surface, splayed, plug and scarf	
	ability to measure, cut and fit patches	
	ability to rasp and sand wood	
	ability to orient grain	
	ability to apply casein or resin glues	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to apply temporary pressure, such as clamping and nailing ability to calculate taper ratios	
16.05 Seals/refinishes wood surfaces.	knowledge of types of sealer/finishes that meet MIL specification requirements knowledge of natural and synthetic resins knowledge of product manufacturer's instructions for preparation ability to prepare surface for resin application ability to mix, brush and spray wood surfaces ability to maintain even spread of resins/sealers	mixing beakers, stir sticks, brushes, paint spray equipment, extractor fans, paint pots
16.06 Covers/re-covers wood structures with fabric.	knowledge of traditional covering methods knowledge of modern covering methods ability to cut, sew and bond fabrics to wood structures ability to select warp direction ability to fill weave ability to smooth and sand ability to brush and spray paint	scissors, pinking shears, sewing machines, sewing needles, brushes, paint spray equipment, sanding blocks, wet/dry abrasives
16.07 Fabricates/moulds/ shapes wood structures.	knowledge of fabrication techniques knowledge of acceptable woods for aircraft	male dies, female dies, hydraulic press, mechanical press, hand saw, plane, chisels, hammer, rasps,

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of woodworking tools and equipment	sanding blocks, woodworking machines
	knowledge of wood bending techniques	
	ability to build a form	
	ability to press a piece to a form	
	ability to bend and shape wood	
	ability to operate woodworking tools and equipment	

BLOCK E SPECIALIZED WORK PRACTICES AND PROCESSES

Task 17 Fabricates/repairs/modifies fluid lines, conduit and fittings.

Trend: Towards higher hydraulic pressures in fluid lines and the introduction of brazed hydraulic lines. Increase in the number of flareless fittings.

Sub-tasks	Enabling Objectives	Tools & Equipment
17.01 Refers to technical information.	knowledge of technical information contained in manufacturers' reference material, SRM, work/snag sheets, production permits, process standards, engineering bulletins and overhaul, maintenance, vendor and parts manuals	
	knowledge of procedures, materials, fasteners, processes, equipment tolerances and standards	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to identify and locate information	
	ability to identify procedures, equipment, materials, fasteners, processes, tolerances and standards	
	ability to interpret information in order to sequence procedures	
	ability to comply with technical information	
17.02 Identifies/labels lines.	knowledge of fluid codes, colours and symbols	crimpers, brush, wipers
	ability to identify and differentiate pressure and return lines	
	ability to clean area to be banded	
	ability to select and apply coloured identification bands	
	ability to fabricate and attach metal tag and colour, symbol and fluid identifiers	
17.03 Removes fluid lines/sections.	knowledge of hydraulic and pneumatic systems	screwdrivers, wrenches, caps/plugs, hazardous waste receptacle, electrical grounding equipment
	knowledge of dangers associated with lines and fluids, such as oil, fuel, mineral and ester based hydraulic fluids	
	knowledge of defueling procedures	
	knowledge of absorbent clean-up materials and procedures	
	knowledge of procedures for electrically grounding an aircraft	

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of warning tags used to alert other maintenance personnel	
	ability to electrically ground aircraft	
	ability to identify lines, contents and systems	
	ability to depressurize system	
	ability to deactivate system	
	ability to select receptacle and drainage procedure	
	ability to safely dispose of wastes and clean-up materials	
	ability to cap and plug junctions	
17.04 Selects materials and fittings for fluid lines.	knowledge of ferrous, non-ferrous and synthetic tubing	
	knowledge of types of tube fittings including flared and flareless fittings and swaging methods	
	ability to select materials and fittings	
17.05 Attaches/replaces fittings.	knowledge of tube swage equipment and techniques	swager, aircraft flaring equipment, tube cutter, wrenches
	knowledge of single and double flaring equipment and techniques	
	ability to swage fittings to tubing	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to cut and deburr tubing	
	ability to flare tubing	
	ability to set m.s. flareless fittings	
17.06 Bends metal tubing.	knowledge of material identification, such as tube and fitting sizes, wall thickness, minimum bend radius and substitute materials	tube bending tools (hand/mechanical), tube cutters
	ability to cut and bend metal tubing	
	ability to coil metal tubing	
	ability to prevent tubing from collapsing by filling tube cavity with products such as sand, mandrils and low-melting point metals	
	ability to measure and fabricate tube template	
	ability to identify and assemble flexible lines/ fittings	
17.07 Tests lines for leakage.	knowledge of operating and testing pressures	test rig, wrenches, leak detecting solutions, air supply, regulator, pressure gauge, caps/plugs, eye safety glasses
	knowledge of test rig operation and safety procedures	
	knowledge of in-field testing equipment and system being tested	
	ability to set up and operate test rig	
	ability to read pressure gauges	
	ability to locate leaks	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to purge lines	
	ability to set up and operate in-field/out-of-shop testing equipment	
	ability to flush tubing	
	ability to cap and plug lines	
17.08 Installs fluid lines.	knowledge of recommended installation and procedures for tubing and hoses	screwdrivers, wrenches, torque wrench
	ability to identify and assemble flexible lines and fittings	
17.09 Fabricates electrical conduits and fire fighting lines.	knowledge of electrical conduit installation methods	caps/plugs, hazardous waste receptacle, electrical grounding equipment, tube benders, flaring tools, deburring tools, tube cutters, tube filling products, drill, air supply, wrenches, screwdrivers
	knowledge of fire fighting lines and installation of fittings	
	ability to deactivate fire fighting equipment	
	ability to cap and plug fire lines	

Task 18 **Repairs/replaces windows and lenses.**

Trend: Towards the use of an occupational task for aircraft structural mechanics.

Sub-tasks	Enabling Objectives	Tools & Equipment
18.01 Assesses windscreen and window condition.	knowledge of thermoplastic materials	depth gauge, ruler, light source, optical micrometer, prism
	knowledge of defects associated with windscreens and windows such as cracking, delamination, crazing, scratches and distortion	

Sub-tasks	Enabling Objectives	Tools & Equipment
	ability to identify thermo-plastic windscreens and windows	
	ability to recognize deterioration of windscreens and windows such as cracking, delamination, crazing, scratches, discolouration and distortion	
	ability to measure depth of scratches	
	ability to determine if windscreen or window must be replaced	
	ability to remove window frames	
18.02 Sands/buffs/polishes windows and lenses.	knowledge of buffing/ polishing compounds	abrasives, cloth, mechanical polishers
	knowledge of acceptable grits of abrasives	
	knowledge of mechanical polishing devices	
	knowledge of repair/ polishing limits	
	ability to wet/dry sand	
	ability to select polishing/buffing compound	
	ability to apply compound	
	ability to operate mechanical polishers	
	ability to identify windows/lenses that do not meet minimum acceptable limits	

Sub-tasks	Enabling Objectives	Tools & Equipment
18.03 Plastic welds windscreens, windows and lenses.	knowledge of equipment to weld/heat surfaces knowledge of behaviour of thermoplastic material ability to operate plastic welder ability to select filler rod material ability to "V out" crack in window or lens ability to apply filler weld to crack/split ability to sand, buff and polish window or lens	soldering gun, plastic weld gun, plastic rods, air source, inert gas, buffing/sanding material, routing tool, grinders
18.04 Lap patches windows and lenses.	knowledge of window/lens material knowledge of approved procedure to lap patch windows knowledge of bonding materials such as glues and sealants ability to stop drill cracks or splits ability to select bonding material and patch ability to cut patch ability to dress patch ability to apply bonding material and align patch with split or crack	file, bandsaw, spatula, pneumatic drill, drill bits, mixing cups
18.05 Replaces windows and lenses.	knowledge of approved removal and installation procedures/techniques for windows or lenses	air drill, screwdrivers, wrenches, rivet gun, bucking bar, spatula

Sub-tasks	Enabling Objectives	Tools & Equipment
	knowledge of conditions when windows or lenses require replacement such as cracking, crazing, warping and distortion	
	knowledge of sealants	
	knowledge of maintenance control standards for windows and lenses	
	ability to remove fasteners such as rivets and screws	
	ability to trim and fit lenses/windows	
	ability to drill holes to size	
	ability to apply gasket and sealants	
	ability to install fasteners	
18.06 Fabricates lenses.	knowledge of size, thickness, shape and material of lenses	bandsaw, screwdrivers, wrench, bucking bars, air drill, drill bits, reamer, countersink, heat source
	ability to measure dimensions of lenses	
	ability to cut lens material	
	ability to form and shape lens material	
	ability to fit and trim lenses	
	ability to drill holes to size for lenses	
	ability to install fasteners	

APPENDIX

TOOLS AND EQUIPMENT

air blowers
air compressors
Allen keys
anodizing equipment, including portable
applicators - hand and pneumatic
balancing equipment
baskets
baths/vats, acid, sodium, chemical, water
bead blasters
beading tools and equipment
bending tools - hand and mechanical
blasting equipment
blind riveting equipment
blocks, contour
box and pan
bradpoints
brakes - finger, hydraulic, pneumatic, straight, bending
Brinell test equipment
brushes
bucking bars
burnishing wheels/tools
C-clamps
callipers
chisels
clamps
Cleco pliers
cold working tools
compressors
cooling tanks
countersinks
crimping tools
crown rollers
curing equipment
cutting wheels, tools, blades, bits and discs
deburring tools
deoxidizers
dies
die grinders/sanders
dividers
drills - air, hand, high speed, bench
drill bits
drill presses
drill motors
eddy-current machines
electrical grounding equipment
electro-static spray guns
electronic leak detection devices
end mills
extractor fans
files
flap-peening equipment
flaring tools
french curves
grinders
hack saws
hammers - clipping, mallet, tack
heating devices - ovens and torches
holding fixtures
hot bonding control units
jacks
jigs
knives - x-acto, rotary, draw, putty
lathes
levelling equipment
magnifying glasses
mandrels
Maule testers
milling machines/equipment
mixers/beakers
mixing containers, tools, equipment
needles
neutralizing tanks
nibblers
oxy-acetylene cylinders
paint pots/brushes
planes
plastic weld guns
plastic rods
plumb bobs
pneumatic squeeze riveter
portable plating machines
presses - hand, hydraulic, mechanical, pneumatic, arbor
protractors
pry bars
punches - centre, chassis, drift, starter, hole, line up, press, arbor, rivet
racks
rasps
ratchets, air
reamers

regulators
riveters
rivet gun/sets
Rockwell test equipment
rollers, joggling
rotary files
routing equipment, tools, double helix
sand blasting equipment
sanding discs, blocks, wheels
saws - table, band, hand, hole, radial
scissors
scleroscope
scrapers
screwdrivers
scribes
sewing machines, needles, iron
Seyboth testers
shears - mechanical, pinking, hand, power, scissors, snips
sockets
soldering guns
spatulas
specialized fastening tools
specialized installation tools/guns
specialized hardening tools
spot facers
spray painting equipment
straight edges
straight rollers
stretching tools
swages
squeezers - hand and pneumatic
test rigs
T-pins
tube benders/cutters
vacuum cleaner
ventilator fans
vice - grips/straps
weigh control units
welding equipment
wire wheels/brushes
woodworking tools/machines
wrenches, torque

MEASURING TOOLS AND GAUGES

borescope
combination square
compass
contour gauge
depth gauge
dial indicator
grip length gauge
height gauge
hole gauge
marking gauge
micrometer
plasti-gauge
pressure gauge
pyrometer
rules
scales
scleroscope
squares
straight edge
tachometer
tapes
telescoping gauge
thermometer
trammel gauge
vacuum gauge
vernier
weigh scale

SAFETY EQUIPMENT

ear muffs
eye goggles
eye wash station
face shields
fire hoses
gas mask
hand shields
leather gloves
leggings
respirator
rubber shoes
rubber gloves
safety apron
safety glasses